

*J. J. Gallaher.*

---

ON

THE FUNCTIONS OF THE BRAIN

AND

OF EACH OF ITS PARTS:

WITH

OBSERVATIONS ON THE POSSIBILITY OF DETERMINING THE IN-  
STINCTS, PROPENSITIES, AND TALENTS, OR THE MORAL  
AND INTELLECTUAL DISPOSITIONS OF MEN AND  
ANIMALS, BY THE CONFIGURATION  
OF THE BRAIN AND HEAD.

---





*J. J. Gallaher.*

---

ON

THE FUNCTIONS OF THE BRAIN

AND

OF EACH OF ITS PARTS:

WITH

OBSERVATIONS ON THE POSSIBILITY OF DETERMINING THE IN-  
STINCTS, PROPENSITIES, AND TALENTS, OR THE MORAL  
AND INTELLECTUAL DISPOSITIONS OF MEN AND  
ANIMALS, BY THE CONFIGURATION  
OF THE BRAIN AND HEAD.

---

*T. J. Hall*

THE UNITED STATES OF AMERICA

ON EACH OF THE 10TH

WITH

OF THE 10TH OF THE 10TH

THE 10TH OF THE 10TH

THE 10TH OF THE 10TH

THE 10TH OF THE 10TH

THE 10TH OF THE 10TH

THE  
INFLUENCE OF THE BRAIN  
ON THE  
FORM OF THE HEAD:

THE DIFFICULTIES AND MEANS  
OF DETERMINING THE FUNDAMENTAL QUALITIES AND FACULTIES,  
AND OF DISCOVERING THE SEAT OF THEIR ORGANS:

EXPOSITION  
OF THE FUNDAMENTAL QUALITIES AND FACULTIES, AND THEIR  
SEAT, OR ORGANOLGY.

---

By FRANÇOIS JOSEPH GALL, M. D.

TRANSLATED FROM THE FRENCH  
By WINSLOW LEWIS, JR., M. D., M. M. S. S.

---

LIBRARY OF THE  
BUTLER MEMORIAL ACADEMY OF MEDICINE,  
IN SIX VOLUMES.  
NOT TO BE REMOVED.

VOLUME V.

no. 2300

BOSTON:  
MARSH, CAPEN, & LYON.  
1835.

*over*

INFLUENCE OF THE BRAIN

ON THE

FORM OF THE HEAD:

THE DETERMINING AND

OF EXTENDING THE INFLUENCE OF THE BRAIN AND THE  
THE AND IN THE DETERMINING THE FORM OF THE HEAD.

EXPLANATION

Entered according to the act of Congress, in the year 1835, by MARSH, CAPEN  
& LYON, in the Clerk's Office of the District Court of the District of Massachu-  
setts.

BY BRANCHES JOHN D. GALL, M.D.

TRANSLATED FROM THE FRENCH

BY WILLIAM LEXIS, M.D.

*6. 2. 1835*

CAMBRIDGE PRESS:

METCALF, TORRY, AND BALLOU.



# CONTENTS.

---

## ORGANOLOGY. Continuation.

	Page
XIII. The faculty of distinguishing and recollecting persons. (Personen-sinn) . . . . .	1
On the forms of the eye, and the causes which determine their diversity . . . . .	3
Seat of the organ of the recollection of persons . . . . .	4
XIV. Faculty of attending to and distinguishing words; recollec- tion of words, or verbal memory, (Wort-gedächtniss); history of the discovery . . . . .	7
Natural history of verbal memory . . . . .	9
Seat and external appearance of the organ of this faculty . . . . .	10
Of the memory of names and of words in the state of disease . . . . .	16
XV. Faculty of spoken language; talent of philology, &c. (Sprach- Forschungs-sinn.) . . . . .	18
Faculty of language in the state of disease . . . . .	22
On the language of animals . . . . .	26
On the organ of the faculty of language in animals . . . . .	31
Philosophical reflections on spoken language . . . . .	33
XVI. Faculty of distinguishing the relation of colors; talent for painting. (Farben-sinn.) . . . . .	46
View of the laws of the proportions of colors . . . . .	50
Talent of painting in mental alienation . . . . .	52
Of the organ of the faculty of colors, and of the external appear- ance of this organ . . . . .	52
XVII. Faculty of perceiving the relation of tones, talent for music. (Ton-sinn.) . . . . .	59
History of the discovery of this organ . . . . .	63
Natural history of the faculty of the relation of tones in man . . . . .	65
Activity of the organ of music in idiocy and in mental alienation . . . . .	68
External appearance of the organ of music in man . . . . .	69
Natural history of the faculty of music, and of its organ, in animals . . . . .	76

	Page
XVIII. Faculty of the relations of numbers . . . . .	80
History of the discovery . . . . .	81
Natural history of the faculty of numbers . . . . .	82
Faculty of numbers in the state of disease . . . . .	90
Seat and external appearance of the organ of numbers . . . . .	91
Are animals endowed with the faculty of numbers? . . . . .	93
On the faculty of time. (Zeit-sinn.) . . . . .	95
XIX. Faculty of constructiveness. (Kunst-sinn, Bau-sinn.) His- tory of the discovery . . . . .	98
Natural history of the faculty of constructiveness in animals . . . . .	99
Natural history of the faculty of constructiveness in man . . . . .	102
Faculty of constructiveness in disease . . . . .	107
Seat and external appearance of the organ of the arts in man . . . . .	108
Observations on constructiveness in the arts, and its organ in man . . . . .	111
Of the organ of constructiveness in animals . . . . .	114
Intellectual faculties and moral qualities, most of which essentially distinguish the human race from all the other species of ani- mals . . . . .	118
XX. Comparative sagacity, aptitude for drawing comparisons. (Vergleichender Scharf-sinn.) History of the discovery . . . . .	121
Farther proofs that the faculty of comparison is founded on the action of the middle cerebral part of the anterior superior re- gion of the forehead . . . . .	122
On the education of the human race . . . . .	125
XXI. Metaphysical depth of thought; aptitude for drawing con- clusions. (Metaphysischer Tief-sinn.) . . . . .	129
XXII. Wit. (Witz.) . . . . .	131
Causality, spirit of induction, philosophic head. (Causalitæt, Fol- gerungs-Vermægen.) . . . . .	135
XXIII. Talent for poetry. (Dichter Geist.) . . . . .	142
A talent for poetry depends on the great activity of a particular fundamental faculty . . . . .	144
Of the poetical talent in mania . . . . .	150
Seat and external appearance of the organ, whose great develop- ment produces the talent for poetry . . . . .	151
XXIV. Goodness, benevolence, gentleness, compassion, sensi- bility, moral sense, conscience. (Gulmæthigkeit, Mitleiden, Moralischer-sinn, Gewissen.) History of the discovery . . . . .	156
Natural history of goodness, sensibility, benevolence in man . . . . .	158
Moral sense, sentiment of justice and injustice . . . . .	167
Of conscience . . . . .	174



	Page
Seat and external appearance of the organ of benevolence . . .	182
Of the action of the organ of benevolence in mania . . .	186
Natural history of benevolence and docility in animals . . .	192
External development of the organ of benevolence in animals . . .	195
XXV. Faculty of imitation, mimicry. History of the discovery . . .	201
Confirmation of the existence of the fundamental faculty of imita- tion, and of its particular organ . . . . .	204
External development of the organ of imitation . . . . .	206
Of visions . . . . .	206
Organization which disposes to visions . . . . .	211
Explanation of visions and inspirations . . . . .	212
XXVI. God and religion . . . . .	215
History of the discovery of the religious sentiment, as a funda- mental quality, and of its organ . . . . .	216
Natural history of man in relation to his belief in God, and his propensity to religion . . . . .	218
Religious propensity in mania . . . . .	230
External appearance of the organ of the sense of the existence of a God, and of the propensity to religious worship. Continua- tion . . . . .	235
Proofs of the existence of God, taken from organology . . . . .	241
XXVII. Firmness, constancy, perseverance, obstinacy . . . . .	243
Seat and external appearance of the organ of firmness . . . . .	245
Conclusion of the exposition of the organs, and of their functions . . . . .	247

*Confirmation of the truth of organology, and consequences which  
flow from this doctrine.*

Agreement between the prevalent form of the head and the moral and intellectual character of nations . . . . .	251
Of physiognomy, or the talent of knowing the interior of man by his exterior . . . . .	261
Of pathognomics, and of mimicry or pantomime . . . . .	266
Of the internal sources of imitation in general, and of the imitation of each feeling, of each passion, &c., in particular . . . . .	268
Natural language of the activity of the instinct of propagation . . . . .	271
Natural language of the organ of attachment . . . . .	272
Natural language of the organ of self-defence . . . . .	273
Natural language of the instinct of destruction, and the instinct of murder . . . . .	277
Natural language of cunning . . . . .	278
Natural language of the instinct of property, or of avarice . . . . .	279

	Page
Natural language of circumspection . . . . .	280
Natural language of the sense of hauteur, and of pride . . . . .	281
Natural language of vanity . . . . .	283
Natural language of the organ of the memory of names and words . . . . .	284
Natural language of the organ of the arts . . . . .	284
Natural language of music . . . . .	285
Natural language of the sense of localities . . . . .	286
Natural language of poetry . . . . .	287
Natural language of satire . . . . .	287
Natural language of meditation . . . . .	287
Natural language of benevolence . . . . .	288
Natural language of devotion . . . . .	289
Natural language of firmness . . . . .	290
Conclusion . . . . .	292
Of universal language . . . . .	294
Remarks on some passages of the work of M. Georget, entitled <i>Physiology of the Nervous System, and especially of the  Brain</i> . . . . .	298

## FUNCTIONS OF THE BRAIN.

---

### XIII. *The Faculty of Distinguishing and Recollecting Persons. (Personen-sinn.)*

I HAVE been struck with the fact, that certain persons and animals recognise, with the greatest facility, individuals whom they have seen years before, though only in passing. This is a faculty which is very feeble in me, and the want of which has caused me, through my whole life, a thousand annoyances. I have seen in all classes, among the people at large as well as among well educated persons, those who possess this faculty and those who are destitute of it. There are persons, and I am of the number, who, when they rise from table, cannot distinguish in the party the person they sat next to during the meal. As this singularity often causes them embarrassment, exposes them to make a thousand ludicrous mistakes, and to pass, with the most indifferent manner, before those who approach them with an air of recognition, they make every effort to avoid such mistakes, but they cannot succeed. It costs them an incredible effort of mind to learn certain faces by heart, and it is only those countenances, that are marked by some peculiarity, which leave on them a durable impression.

On what does this depend? Those, who give only a superficial attention to this phenomenon, always have reasonings, or rather sophisms, ready to explain every thing, say that this belongs to the eye; that such

persons see in an indeterminate manner, or are near-sighted. My own example proves that it is not so. There are few men whose vision operates in a manner more determinate than mine. I have always been able to distinguish from each other, at considerable distances, birds and other animals, and plants, by their general appearance alone. I have never been near-sighted; and with a single look I distinguish, with the greatest clearness, all that surrounds me.

Does it depend on the faculty of comprehending the qualities of objects? Neither is it this which decides; there are hardly any persons who have exercised themselves more in this respect than I have; for both as a physician and a naturalist, I have made it my great business to know how to distinguish, both the various maladies which afflict the human race, and the infinitely varied objects which nature presents us. Though I neither know how to paint nor draw, I have always distinguished with great facility the numerous forms of the head; and were it an object to direct a painter, I certainly could indicate to him the most characteristic traits of the person, of whom he wished to make a portrait.

To be convinced that all these explanations are false, it is enough to cast an attentive look on what is passing in nature. Frequently, children from three to five years of age already possess the memory of persons to a very great degree. There are dogs who recognise, after years, a person whom they have seen but once; while other dogs, after a few days of absence only, no longer recognise persons whom they have frequently seen. Monkeys, dogs, horses, elephants, goats, and even birds, recognise, with more or less facility among a thousand others, their master, or one who has shown them kindness, or, one who has offended them.

All the animals which live in flocks, know each other,—who would believe it? All the bees of the same hive know one another, and their number



amounts to from twenty to eighty thousand. It is even remarked, that the bees of the same apiary, consisting perhaps of fifty to one hundred hives, well know how to distinguish a bee which does not belong there. The lamb, the chicken, &c., know their mother in the midst of a great number of sheep and fowls, &c.

No one can doubt, that the faculty of discerning individuals is, for the animal, one of the most essentially necessary of the fundamental faculties. It cannot, therefore, be supposed, that nature has made such a faculty to depend on accessory circumstances. Whoever knows the maternal solicitude of nature for all animals, will admit, that it depends on a particular interior organization — on a proper organ.

I think I have arrived by observation to the discovery of this organ ; but before entering into any details concerning it, I must say a word on the different forms of the eye, and on the causes, which determine the diversity of these forms.

*On the Forms of the Eye, and the Causes which determine their Diversity.*

The eyes are placed in the orbits. According as the form of these osseous cavities varies, the balls have also a different form and position. The form of these cavities is determined in a great measure by the brain ; this makes it clear how the position of the eye may be an external indication of the greater or less development of certain cerebral parts.

This cavity presents four walls. 1. The roof, which is formed by a part of the frontal and the sphenoid bones. 2. The internal wall, formed by a part of the os planum, and by the os unguis. 3. The external wall, formed by a part of the sphenoid and of the malar bone. 4. The inferior wall, formed by a part of the palatine, of the malar bone, and the su-

perior maxillary. Of these four walls, the roof and the posterior part of the external wall are alone in immediate contact with the brain. This part of the external walls corresponds to the anterior extremity of the middle lobes of the brain, while the inferior surface of the anterior lobes lies on the roof, xv. xvi. xvii. xviii. xix. Pl. v. viii. xv. xvi. xi. xii.

The form of the orbit is found totally or partially changed, according as all the cerebral parts placed on the roof, or only some among them, are more or less developed. When they are very feebly developed, the whole orbit is found placed high, and the eyes are raised and brought near the superior orbital arcade; in this case, the orbits are deep and formed like a hollow cylinder. But, when all these encephalic parts have acquired a high degree of development, the eyeballs are pushed forward, whence result large prominent eyes.

In this case the low roof depresses the ball, which, in its turn, depresses the inferior arch of the orbit toward the cheek, and produces below the inferior lid a kind of protrusion. When the external part, xix, is alone developed, the corresponding part of the arch is alone depressed, which determines the depression of the external part of the eyeball, and of the external commissure of the lids, as well as the size of the external orbital angle. When the internal part, xvi. is alone much developed, the internal part of the roof is alone depressed; this directs the internal commissure of the lids, downward.

### *Seat of the Organ of the Recollection of Persons.*

Those eyes, whose internal part and the corresponding palpebral commissure are depressed, indicate, as I have discovered, after twenty years of observation, the great development of the memory of persons. But having met this faculty in a high degree



in persons who had not the eyes placed in the manner indicated, I thought I had judged hastily, and said no more in my account of the cause of this organization; but since then I have found my first opinion confirmed so often, that I have been forced to return to it.

Every time that I find the eyes so placed in an individual, whose organization is not otherwise too repulsive, I can engage that he has great facility in recognising persons. But one cannot always deny this faculty to those, who have not their eyes placed in this manner. It may happen, that the neighbouring organs being advantageously developed, there results a depression of the whole ball and a horizontal position of the two eyes. In such case one might incorrectly believe, that there is an inconsiderable development of *xvi.* and *xix.* This difficulty may occur the more easily, as *xvi.* and *xix.* are both very small organs.

Idiots have often been shown us, who by their faculty of recognising persons, caused the astonishment of physicians. We have constantly found, in these individuals, the above indicated position of the eyes.

It is probably this faculty, carried to a very high degree, which principally constitutes, in a painter, the talent of successfully seizing a resemblance. This resemblance is not limited to the features; it is composed of whatever is characteristic in the whole person, the habitual gestures, the gait, the dress, &c. Hoffman, the famous portrait painter at Friburg in Brisgau, has in an eminent degree the eyes which we have described. I find the same conformation in Titian and Tintoret, who both excelled in the painting of portraits.

In the print of Montaigne, who constantly paints the whole person, the eyes are manifestly depressed at the internal angle.

I have always been struck with the direction of the eyes of Sterne. Pl. *LXXXIII.* fig. 6, it will be difficult to find any which present to a higher degree the sign

of this faculty. Convinced, many years since, that, in the greatest number of cases, the conduct of man is but the counterpart of his organization, I have lately read Sterne a second time. Both in *Tristram Shandy* and in the *Sentimental Journey*, we meet with portraits drawn with great detail, and minute to excess, although such portraits are not essential to the design of the author. We read, for example, in the *Sentimental Journey* ; —

“I have his figure this moment before my eyes, and think there was that in it, which deserved better. The monk, as I judged from the break in his tonsure, a few scattered white hairs upon his temples, being all that remained of it, might be about seventy ; but from his eyes, and that sort of fire which was in them, which seemed more tempered by courtesy than years, could be no more than sixty — Truth might lie between — He was certainly sixty-five ; and the general air of his countenance, notwithstanding something seemed to have been planting wrinkles in it before their time, agreed to the account.

“It was one of those heads which Guido has often painted, mild, pale, penetrating, free from all commonplace ideas of fat, contented ignorance looking downwards upon the earth ; it looked forwards ; but looked as if it looked at something beyond this world. How any of his order came by it, heaven above, who let it fall upon a monk’s shoulders, best knows ; but it would have suited a Bramin, and had I met it upon the plains of Indostan, I had revered it.

“The rest of his outline may be given in a few strokes ; one might put it into the hands of any one to design, for t’was neither elegant nor otherwise, but as character and expression made it so : it was a thin, spare form, something above the common size, if it lost not the distinction by a bend forward in the figure, but it was the attitude of entreaty ; and, as it now stands presented to my imagination, it gained more than it lost by it.

“When he had entered the room three paces, he stood still; and laying his left hand upon his breast, (a slender white staff with which he journeyed being in his right,) when I had got close up to him, he introduced himself with the little story of the wants of his convent, and the poverty of his order, and did it with so simple a grace, and such an air of deprecation was there in the whole cast of his look and figure, I was bewitched not to have been struck with it.”

In another place; “She was dressed in white, and much as my friend described her, except that her hair hung loose, which before was twisted within a silk net; she had superadded likewise to her jacket, a pale green riband, which fell across her shoulder to the waist; at the end of which hung her pipe.—Her goat had been as faithless as her lover; and she had got a little dog in lieu of him, which she had kept tied by a string to her girdle; as I looked at her dog, she drew him towards her.”

In another place he says, “And in translating according to my custom, French figures and attitudes into English.”

Such a correspondence between the organization of a writer, and the kind of spirit that pervades his works, is a strong presumption, that the sense of persons or individuals must be recognised as a fundamental faculty, which has its proper organ in the brain.

**XVI. *Faculty of attending to and distinguishing Words; Recollection of Words, or Verbal Memory, (Wort-gedächtniss); History of the Discovery.***

In my ninth year, my parents sent me to one of my uncles, who was a curate in the Black Forest. The latter, to inspire me with emulation, associated with me in my studies another boy of my age. They often reproached me, because I did not learn my les-

son, as well as my fellow pupil, although more was expected from me than from him. From my uncle's house my companion and myself went to Baden, near Rastadt. Among thirty scholars that were there, when the object was to recite by heart, I had always to fear those, who in composition obtained only the seventh or even the tenth place. Two of my new fellow pupils surpassed even my former companion by their facility of learning by heart. As both had large, flaring eyes, we gave them the nickname of *saucer-eyes*. After three years, we went to Bruchsal; there again, some scholars with saucer-eyes caused me mortification when the point was to learn by heart. Two years afterwards I went to Strasburg, and I continued to remark that the pupils, who learned by heart with the greatest facility, were those who had large, flaring eyes, and that some among them, in other respects were only indifferent scholars.

Even if I had had no preliminary knowledge, I could not have avoided the inference, that eyes thus formed are the mark of an excellent memory. It was not till afterwards, that I said to myself, as I have already mentioned in the introduction to my first volume, if memory manifests itself by an external character, why should not the other faculties have their characters outwardly visible? It was this which gave the first impulse to my researches, and which was the occasion of all my discoveries.

It will, no doubt, be thought singular, that it is precisely on the subject of this faculty and its organ, that my works are least complete. I shall confine myself wholly to facts. The facts will remain immoveable, even in case my manner of viewing them should undergo some modifications.



*Natural History of Verbal Memory.*

Men long since began to distinguish this species of memory, by the aid of which we learn by heart with great facility, even things which we do not understand, and have termed it *memory of words, verbal memory* (*memoria verbalis*). It was also known that those, who have an excellent memory for words, have not always the other faculties to a very eminent degree; and this idea was even too much generalized. The conclusion should have been, that this faculty supposes a particular organ; but though proofs without number, were presented in support of this opinion, received prejudices were opposed to admitting it. Almost every where, in the schools, in the various institutions of education, in the lives of philosophers, we see examples of prodigious memory, without the subject endowed with it having given evidence of other faculties to an eminent degree. If, in treating of this faculty and the following ones, I burden the reader unusually with names and words, let him throw the blame on the faculty of which I treat.

The memory of words is sometimes manifested in a surprising manner from the tenderest infancy. At Landau, a boy of five years of age knew by heart all the Catechism, all the Fables of Lafontaine, and a great number of other poetical pieces; he also learned by heart, without at all understanding it, an entire volume of the mathematics of Bezout; he knows in the same manner much of history and geography. Dr. Spurzheim saw, at Linden, a young boy, who is likewise a prodigy of memory. In treating of the succeeding organ I shall cite several other examples of the same kind.

Persons, endowed to a high degree with verbal memory, recite by heart a very long passage, a great number of verses, an entire play, after having read it once or twice. They know how to quote on every occasion the finest passages of the classic authors,

A man was one day presented to Frederic II., endowed with such a memory, that he recited by heart a considerable piece, which he had never heard read but once. The same day, Voltaire had to read some verses to the king. Frederic concealed the stranger behind a screen, and when Voltaire had finished reading, he told him that the piece was neither new nor of his composition; and then made his accomplice appear, who recited it, and maintained that he had himself composed it twenty years before. Let the reader judge of the fury of the irascible Voltaire, and of the shouts of laughter of the philosopher of Sans-Souci.

I had already remarked at Vienna, and I found this observation confirmed in the whole course of my travels, that persons endowed with verbal memory apply themselves in preference to a kind of study, in which many words are needed; for example, to mineralogy, entomology, ichthyology, ornithology, natural history in general, or to numismatics, heraldry, &c.

The memory of words is highly important to comedians, though far from constituting by itself a great actor.

I have already cited, in several places, examples of the entire loss of this kind of memory, without the other faculties being in the least disturbed in consequence.

### *Seat and external Appearance of the Organ of this Faculty.*

In treating of the organ of the memory of persons, I have said, that the anterior convolutions of the middle lobe touch the posterior external parts of the orbit. When these convolutions are very much developed, this part of the sphenoid, which forms the posterior third of the external wall of the orbit, is pushed forward; this diminishes the depth of the orbit, and renders the eyeball prominent.



It is, however, by no means probable, that the middle lobe is peculiar to the faculties. The frugivorous animals have only the internal convolutions, and they learn words and names, as well as the carnivorous animals. Besides, memory has too little analogy with the carnivorous instinct to permit us to suppose, that the convolutions of the middle lobe, placed above the ear, constitute the organ of the carnivorous instinct, and the anterior convolutions of the same lobe, the organ of the memory of words.

Now, if it happen in fact, that the ball is pushed in front of the orbit by a considerable development and a great prolongation of this lobe, the form of eyes which results from it, would no longer be the mark of a great memory. This is perhaps the reason why certain persons possessing large eyes projecting even with the head, in the prime of life and health, have not always a more than ordinary memory. It is at least certain, that some persons learn by heart in general with facility, but have a treacherous memory for names; while others easily fix names in their minds, but have much trouble to recollect pieces, however inconsiderable, whether prose or verse. I have not yet succeeded in discerning well all these varieties; but in ten cases that might be referred to me, I should not be deceived in more than one. I should be still less likely to deceive myself, if the organ of this faculty were not placed in such a region, that it can easily extend itself in all directions, from above downward, forward, laterally, and from below upward.

I regard, as the organ of verbal memory, that cerebral part which rests on the posterior half of the roof of the orbit, (Pl. iv. between xv and 59.) In the prints we have not given ciphers peculiar to the part in question, because we had considered the memory of words only, as forming a part of the faculty of speech.

Yet it is certain, that frequently it is only the posterior half of the orbital plate, which is found depressed by the great development of the cerebral part indicated;

and, in this case, the posterior part of the orbit must equally lose its depth, and the ball be pushed forward. This form of eyes is often met with, without the circumstances, which I shall indicate in speaking of the faculty of language, taking place at the same time. It is for this reason, that I treat of this organ separately.

Let us observe persons who make collections ; we shall find ninety-nine in a hundred have large, flaring eyes. It appears, that the necessity of furnishing their head with a great number of names inspires them with this love of collections. They experience great pleasure in retaining with great facility, the names of the thousand objects which they collect. My respectable master, M. Jacquin, sen. Professor of Chemistry and Botany ; the Abbé Mazola, and M. Kreuzer, both of them Entomologists ; the Baron Vanderluhe, the Count of Herberstein, Botanistr at Vienna : the Counsellor Bloch, Botanist and Entomologist at Dresden, who each form with ardor collections in their respective departments ; M. Cetzels of Potsdam, who makes collections of all the objects met with in commerce ; Røeding, at Hamburg, M. Martens, at Bremen, who has made a precious collection of algæ ; Beuth, at Hamburg, who amasses all that can be considered objects of natural history ; Gering, at Frankfort, who makes a collection of insects and butterflies ; Professor Sukow, at Heidelberg ; Goll, who makes a collection of prints ; Winter, at Amsterdam, who collects birds, monkeys, and shells ; Messrs. Camper, father and son, at Francker, Bruggmans, at Leyden, &c., have all, without exception, large, flaring eyes. Temmink, at Amsterdam, who is making a collection of monkeys and birds, has this organization to a less degree than the others ; but yet, as he says himself, makes this collection, only in the idea of establishing one day, according to certain characters, a division of the different varieties of these animals. I should never finish, if I wished to cite all the examples within my knowledge, which confirm this observation.

Hufeland speaks of an individual having large eyes singularly projecting, and who has yet no memory : he says very large, eyes singularly projecting.

It is precisely this manner in which he expresses himself, which makes the observation suspicious to me ; for such eyes are frequently the sign of disease, either rickets or hydrocephalus, which the patient has experienced in his early years. Although such persons in maturer life appear to enjoy good health, the practised physician can discover in them the traces of their former disease ; they are very sensitive and extremely irritable ; their head is not symmetrical, it is more elevated sometimes before, sometimes behind, sometimes on the sides, and they are greatly disposed to mania. Certainly such projecting eyes cannot coincide with an excellent memory.

In the second place, such persons may have already lost the faculty with which they were originally endowed. Excesses of every kind, too long sustained mental effort, severe diseases of long duration, misfortunes, frequent lying-in, singularly enfeeble the memory. In subjects who have incurred these accidents, we can only determine what existed formerly, and by no means what exists now.

When a person unacquainted with organology asks of a stranger whether he has a good memory, he may receive such an answer as to mislead him. I one day asked a young person in whom I observed very large projecting eyes ; " Have you a good memory ? " " No," said she, " I cannot remember any thing at all." " Yet you have been to school ? " " Certainly." " And how did you manage to learn your catechism ? " " In almost no time, I knew it from one end to the other ; no one of my companions could equal me in this respect : I could recite it still to you entire and even backwards." " But you have just told me that you could remember nothing." " Ah ! my God, that is but too true : I forget all the commissions which my mistress gives

me." This explained the enigma. The case, which Hufeland cites, was perhaps of the same nature.

It remains for me also to examine, how far the masses of fat, placed behind the ball, may become sources of error. A man of my acquaintance once experienced violent headaches for a long time. The cephalalgia affecting at first the right side exclusively, the right eye sunk in the orbit; the pains having afterward reached the left side also, the left eye underwent the same change. I would not venture to decide whether this sinking of the eyes was occasioned by the mere absorption of the fat placed behind the ball, or, whether there was a diminution of the cerebral mass placed behind the eyes. It is known, that, by emaciation of the whole body, the eyes sink equally, and that by strong congestions of the blood to the head, they appear more projecting; but these are circumstances which could not lead a physician into error.

It would be possible, that the dimensions, more or less considerable, of the ball itself might here enter into the account; but we must not forget, that the dimensions of the ball are in proportion to those of the orbit, and that the form and size of the orbit, are determined in a great measure by the brain.

I have said, that the cerebral mass, belonging to the memory of words, might act in all directions. I should wish to know more precise cases, to be able to determine, in what circumstances, the considerable development of these parts has acted in one direction or in another. The greater or less diameter of the head, from one temple to the other, might serve as an important guide. A great diameter in this direction is always a favorable augury for the memory of words. The eyes are also sometimes more, sometimes less distant, so that the root of the nose is sometimes broader and narrower; which equally indicates, that there exists in this region a cerebral mass more or less considerable. I have seen persons, who, with an ordinary conformation of the eyes, yet learned by heart with great



facility. But, in these cases, the diameter from one temple to the other is ordinarily very considerable, and sometimes even the inferior part of the temples is projecting, which attests a great development of the adjacent cerebral parts.

I often hear others speak of hollow eyes, where I see large prominent ones. This happens when the inferior part of the forehead projects considerably; such a prominence makes the eyes appear sunken, though placed in orbits which have no great depth in the skull. A forehead, which projects in its inferior part, indicates a great prolongation of the cerebral part placed on the orbital plate. The eyes of which I mean to speak are well cut, well opened, and the ball advances in a half sphere beyond the inferior part of the orbit. Deep eyes, on the contrary, are rather small, and do not pass the edge of the inferior arch of the orbit. Compare the eyes of Racine, Pl. LXXXIV. fig. 1, of Milton, fig. 2, with those of Rousseau, fig. 3.

Milton wearies me by the crowd of names of which he is every where lavish. In the first canto of *Paradise Lost*, there is an enumeration of names which takes several pages. In all his poems he gives names to all the objects of which he speaks, of whatever nature they may be. Here again is the impress of the organization of the writer.

Racine, it is said, never forgot any thing. J. J. Rousseau, on the contrary, complains without ceasing of his bad memory.

"Every morning about ten o'clock," says he, "I went to walk in the Luxembourg, a Virgil or a Rousseau in my pocket; and there, till the hour of dinner, I recalled to memory sometimes a sacred ode, sometimes a bucolic, without being discouraged; because in conning over that of the day, I never failed to forget that of the previous evening."

Two women of my house had small sunken eyes. After more than eight years, they had not succeeded

in retaining the names of persons to whom I was in the habit of rendering professional attention.

*Of the Memory of Names and of Words, in the state of Disease.*

An officer was wounded by a thrust immediately above the eye. He tells me, that since this moment he has had much trouble in remembering the names of his best friends; he had absolutely no knowledge of my doctrine. He does not perceive any debility of his other faculties.

At Marseilles, another young man received, above the eyebrow, a stroke of a foil, which destroyed entirely his memory of names; he could not recall those of his most intimate friends, not even that of his father. I have cited other similar facts in several places of this work.

Baron Larrey had the kindness to bring me one of his patients, whose history is as follows:

Edward de Rampan, aged twenty-six years, received from a foil, the point of which had been broken on the cushion, a blow on the middle part of the left canine region, near the nostril, in a direction oblique from below upward, and a little so from without inwards. The instrument penetrated to the depth of about three and a half inches, across the left nasal fossa, crossed the cribriform plate of the ethmoid near the insertion of the falx cerebri, and appears to have penetrated, in a vertical direction and a little oblique from before backward, to the depth of five or six lines in the internal posterior part of the anterior left lobe of the brain, in such a manner as to approach the anterior part of the mesolobe.

The patient experienced a very considerable hemorrhage at the very instant of the wound, and a very large quantity of splinters escaped by the nose and mouth.



All the organs of sense were paralyzed at the instant; but they have by degrees recovered their functions, and there remain at present only the following alterations:

The sight of the left eye has been totally lost for a month; it is now restored, but the patient sees all objects double.

The smell was totally extinguished; it is restored at present, and the patient can distinguish the odorous alcoholic liquors from the inodorous liquids.

The taste was equally destroyed. It returned by degrees on the right side of the tongue, so that the right half of this organ perceives savors very well, while the left side is deprived of this faculty; the whole of this organ is drawn to the right in opposition to the hemiplegia, which exists on the right side; the mouth being thrown to the left.

The hearing, first lost in the ear of the wounded side, was subsequently restored, and nothing now remains but a buzzing.

The voice, which was likewise lost, has been also restored, and there remains only a slight stuttering.

The force of the generative organs has been perfectly preserved. There supervened a hemiplegia of the whole right side; there remains now only a paralysis of the upper and lower extremity of this side for locomotion only, the sensibility remaining untouched.

The memory of names has been wholly extinguished, and is reproduced now with great difficulty; while the memory of images, and of all which is susceptible of demonstration, is perfectly sound.

The mental aberration, which existed in the first periods in the organs of intellect, has now ceased; but whatever has relation to his self-love, to his military success, &c., throws him into a state of profound alienation and melancholy; while the conversations, which have relation to his family, neighbours, friends, restore his faculties again.

The patient recalled to himself very well the person, the figure, and the face of Baron Larrey; he would have recognised him without difficulty; he saw him always before his eyes, (the patient's own expression,) yet he could not recall his name, and always designated him as Mr. Such-a-one.

I have seen this patient, and have convinced myself that his state is such as it has been just described to me.

If the memory of words is often destroyed in the state of disease, it happens sometimes also, that this faculty acquires a greater degree of activity. The following is an example.

A madman, says Pinel, cured by Dr. Willis, has thus given the history of the paroxysms. "I always," says he, "awaited with impatience the access of agitation, which continued six or twelve hours, more or less, because, while it lasted, I enjoyed a sort of beatitude. Every thing seemed to become easy to me; no obstacle arrested me in theory, or even in reality; my memory suddenly acquired a singular perfection; I recalled to myself long passages from the Latin authors."

I think the difficulties we have encountered in this treatise on the organ of words, will disappear, in proportion as we advance in the treatise on the organ of spoken language, which is to follow.

## XV. *Faculty of Spoken Language; Talent of Philology, &c., (Sprach-Forschungs-sinn.)*

The treatise on this faculty will offer important remarks of more than one kind. I shall occupy myself, first, with the material and experimental part, and shall conclude with philosophical considerations. When the greatest part of the middle portion of the inferior anterior convolutions, placed on the superior plate of the orbit, or on the roof, is greatly developed, this wall is not only flattened, but even depressed.

Hence results a peculiar position of the eyes. In this case, the eyes are at once prominent and depressed towards the cheeks, so that a certain space is found between the ball and the superior arch. The ball, thus depressed, acts on the inferior arch and augments its cavity. This large cavity produces in the living subject, when he has the lids open, the appearance of a little pouch filled with water, and hence the name of *eyes with pouches*. (See Pl. LXXXII. fig. 3, 6; Pl. LXXXIII. fig. 4; Pl. LXXXIV. fig. 1, 2, 5, 6; Pl. LXXXV. fig. 1.

Persons who have the eyes thus formed, possess not only an excellent verbal memory, but they feel a peculiar disposition for the study of languages, for criticism; in general, for whatever has relation to literature. They compile dictionaries, write histories; they are well fitted for the offices of librarian and keeper; they collect the scattered treasures of all ages; they compile learned volumes; they search into antiquities; and, however little other faculty they may possess, they excite the admiration of every body by their profound erudition.

Sometimes this faculty is already very active in childhood. At the age of six years, Baratier (Pl. LXXXIV. fig. 6,) already knew more than six languages; at so tender an age he translated the Greek authors, and corrected the translations of his predecessors. We see, that this youthful philosopher had a very happy conformation of the scull, and large *pouched eyes*. Louis Dufour de Longuerue was, from the age of four years, a prodigy of memory. The living and dead languages, history, theology, ancient and modern philosophy, antiquities, belles lettres, chronology, geography, were familiar to him. He dictated an historical description of France absolutely from memory, without consulting any book. We have seen the son of Dr. Perking, aged only eleven years; he was occupied with languages the whole day; he understands Latin, Greek, Arabic, and several living languages. His eyes are formed like those of Baratier.

I need not say, that such an organization acts very differently, according as it coincides with the greater or less development of other organs. When it is joined to eminent superior faculties, it produces universal geniuses, who embrace the whole sphere of activity of human intelligence. (Pl. LXXXII. Galileo, fig. 3, Bacon, fig. 6 ; Pl. LXXXIII. Rabelais, fig. 4 ; Pl. LXXXIV. Voltaire, fig. 4.

I am going to give the list of a certain number of remarkable men, endowed with this organization, without taking account of their other faculties, and without confining myself to chronological order.

The work of Dominicus Custos, printed at Augsburg in 1612, contains engravings of the persons, whose biography he gives. We have been not a little astonished to see, that the organization, of which I have spoken, is found in all the learned men, of whom mention is there made as philologists. Such, for examples, are Just. V. Mathiolus, who had also a collection of plants ; Occo, a physician who possessed a collection of medals ; Aldovrandus, a naturalist ; Jerome Wolf, David Hoischel, Gryph, Nicholas Glanardus, William Canter, Francis Pogge, all philologists.

Pic de la Mirandole had so great a memory, that it was sufficient for him to hear a book read three times, and he would recite two or three pages in succession, or even repeat the words of these two or three pages in a retrograde order. It is related, that at the age of eighteen years, he knew twenty-two languages. Milton (Pl. LXXXIV. fig. 2,) was possessed of the most vigorous memory, so that all the studies of his youth were constantly present in his mind. His history of England supposes the knowledge and comparison of all the cotemporary writers, even of those who have put in operation the first materials. Coming from the hand of a blind man, it was as astonishing a prodigy as *Paradise Lost*. He was author of principles of grammar, of dictionaries, and knew Latin, Greek, Hebrew, Syriac, &c. The position and conformation of



his eyes announce this prodigious memory in the most distinct manner.

Rabelais (Pl. LXXXIII. fig. 4,) was acquainted with the languages, ancient and modern, grammar, poetry, philosophy, astronomy, jurisprudence, medicine. He had furnished his memory with all the riches of his time. But let us attend also to the considerable development of the frontal parts, both superior and inferior. Let us consider also the admirable organization of Leibnitz, Haller, &c. Let us direct our eyes to the portrait of Edmund Castell, (Pl. LXXXV. fig. 1,) which is found at the head of his *Lexicon Heptaglosson*, a work which will continue for ages the resource of all philologists. What a resemblance appears in the organization of all these distinguished men !

Pelloutier, philologist ; Perrault, architect and writer ; Perron, who studied by himself Greek, Hebrew, philosophy, and the poets, a writer of prodigious memory ; Rollin ; Renaudot, who knew seventeen languages, and history ; all had large pouted eyes ; as well as Crebillon, (Pl. LXXXIV. fig. 5,) who never wrote his pieces till it was necessary to give them to the theatre. When he presented to the players his tragedy of *Catiline*, he recited the whole of it to them from memory ; he never forgot any thing that he had learned.

Let us consider the eyes of Strabo, of Arétin (Leonard), polygraphist, historian, and translator ; of Sarpi, author of the history of the Council of Trent ; of Gibbon ; of John Müller, author of the history of Switzerland ; all have eyes very prominent and depressed toward the cheek.

Let us consider the portrait of Adelung at Brunswick, and that of his daughter, who inherited her father's genius for languages ; those of Messrs. Bottiger, of Dresden ; Heyne, of Gottingen ; Schlosser ; Birkenstock, of Vienna ; Saxe, of Utrecht ; Murr, of Nuremberg ; Harles and Meusel, both of Erlangen ; Krans, of Königsburg ; Rasdorfer, of Schweinfurt ; Wolf, of



Berlin ; Wolke, of Leipsick ; Binger, of Manheim ; the last became blind from excessive reading. Finally, let us admire the external sign of this beautiful faculty in our two celebrated professors of the university of Paris, MM. Desgenettes and Percy.

I should fatigue the reader by multiplying quotations. Whenever I look at the portrait of a man who has gained a name, in a department which supposes this kind of memory, I find large depressed eyes. How, after this, could I doubt, that this is a proper fundamental faculty, and that the organ has its seat above the orbital plate ?

The facts prove to demonstration, that this organization always produces the same turn of mind. To what fundamental force can we refer the functions of this organ ? Is it by means of this that the human race has created for itself a spoken language ? Has this organ traced to nations the immutable laws of general grammar ? These are questions, which can be answered only after very numerous observations. The following might lead to the supposition, that they ought to be answered affirmatively.

### *Faculty of Language in the State of Disease.*

A certain woman had intellectual faculties sufficient to arrange her household and take care of her children. But although her hearing was good, she could never learn to speak. In her cranium, the superior orbital plates are hollowed into a spherical shape, a certain proof, that the cerebral parts, placed above, were very feebly developed. In the cranium of an individual completely idiotic, the superior orbital plates likewise take a spherical form in the cranial cavity.

Pinel reports a fact, which I shall give in this place.

A notary, in consequence of an attack of apoplexy, had forgotten his own name, that of his wife, his

children, and his friends, although, otherwise, his tongue retained all its mobility. He no longer knew how to read or write, and yet he appeared to remember objects, which had formerly made an impression on his senses, and which related to his profession of notary. He has been seen to point out with his fingers the files of papers, which enclosed acts which could not be found, and indicate by other signs, that he preserved the former chain of his ideas.

A soldier, whom Baron Larrey had the kindness to send me, is in a state almost similar.

It is likewise in consequence of an attack of apoplexy, that this man finds himself unable to express his sentiments and ideas by spoken language. His face carries no trace of deranged intellect. His mind finds the answer to the questions addressed to him and he does all in his power to express it. I showed him an arm-chair, and asked him if he knew what it was ; he answered me by sitting down in the chair. He is incapable of articulating, immediately, a word, which is pronounced in order to make him repeat it ; but, some instants afterward, this word escapes him involuntarily.

In his embarrassment, he points with his finger to the lower part of his forehead ; he manifests impatience, and indicates by his gestures, that it is from that point, that his inability to speak comes. It is not his tongue which is embarrassed ; for, he moves it with great activity, and pronounces very well a large number of insulated words. Neither is his memory in fault ; for, he manifested to me very strongly, that he was sorry not to be able to express himself on many things, which he would have wished to tell me. Nothing is lost in him but the faculty of speaking. This soldier, like Pinel's patient, is no longer capable of reading or writing.

Perhaps similar facts throw light on those mental diseases, in which the patients absolutely refuse to speak. I have the skull of a madman of this species ;

in this skull also the superior plate of the orbit forms a vault elevated to the segment of a sphere.

It might be said, that in these cases in which the nervous system is attacked with weakness, it is the part previously the most feeble, which suffers most, and that the patient finds himself incapable of speaking, and has even lost the recollection of ever having spoken, though the exercise of his other intellectual faculties continues to take place to a certain extent. This would also explain how, after a fall, or any lesion, a man, from disease, may find himself incapable of speaking, without this incapacity being imputable to a palsy of the vocal organs. In such cases we have tried, in the insane hospital at Vienna, to excite the action of the brain, not only by internal treatment, but also by friction, for example, with the ointment of tartarized antimony, and we have thus succeeded in restoring the faculty of speaking.

There are children from two to twelve years of age, and even of fourteen, who know not how to speak, although they are not idiots, and understand nearly as well as other children, who speak. In these cases, the fault does not lie in the vocal organs, as the ignorant sometimes persuade themselves, and still less in a state of apathy of the subject. Such children, on the contrary, often have great physical vivacity; they do nothing but jump, pass from one idea to another with astonishing rapidity, and fix their attention on nothing. When you hold them, and pronounce in their ear a name or any other word, they repeat it distinctly. It is very difficult to make this experiment twice in succession, and impossible to go to three times, which proves a general weakness of the organs of the intellectual faculties. Sometimes, however, such subjects are capable of expressing their ideas and sentiments in writing with sufficient order, which well proves, that their intellectual weakness is peculiarly relative to the faculty of speaking. Though these cases are not absolutely rare, I have not hitherto

been able to procure the cranium of such a subject. When we treat these children by a tonic curative method, when we do not compel them to undergo too strong an exertion, and too long continued exercise of their feeble intellectual faculties ; when, by the progress of age, their cerebral parts gain more consistence, their intellectual faculties often develope themselves by degrees, and they at length acquire the faculty of speaking, and take rank among reasonable people. It is only in the case, in which there exists hydrocephalus, or any other organic disease, that we need despair of a favorable event.

Spurzheim saw, at Inverness, in Scotland, a man who, being struck with apoplexy, knew the qualities of objects, who recalled vocal signs, but who could not pronounce them. If a color was shown him, as green for instance, and the question was asked whether it was brown, yellow, or any other color than green, he said no ; when the true color was named, he replied in the affirmative. Spurzheim observed a similar case at Paris. The man understood all that was said to him, but could not find the pronunciation of the words which he wanted. He asked for different objects ; and if the article was brought him which he mentioned, he always said it is, or it is not, that.

Sometimes this species of memory is found exalted in the state of disease. The patients recall events of which they had no recollection in the state of health. They quote whole passages which were long since forgotten ; they speak languages which they had learned in infancy, but of which they had completely lost the exercise.

The organ of the faculty of language is perhaps particularly excited in those cases of alienation, in which the patients think they hear some one addressing them. I have had charge of two women affected with this kind of mania, both had large, flaring eyes depressed toward the cheeks.

The same irritation appears to exist in those mal-



men who think they speak all languages. In a madman of this sort, whom we saw at Berlin in the great hospital, called la Charité, the cerebral part peculiar to this function was unusually developed.

There exists, then, a partial mania limited to the faculty of speaking; now this phenomenon would be impossible, if the faculty of verbal language were not founded on a particular cerebral part.

In order the better to show what the language of words is, and what the faculty is which gives birth to it, it will be useful to examine its mode of existence and its different degrees of perfection in animals.

### *On the Language of Animals.*

All language is the expression or the manifestation of the ideas or the sentiments, which men or animals experience. There are consequently as many different languages, as there are means of expressing or communicating one's ideas or sentiments. These means are either verbal sounds, or gestures, signs imperceptible to the ear. Sounds and gestures are either natural or arbitrary; man makes use of two languages; where natural signs are not sufficient for him, he invents arbitrary ones. Animals have the language of signs. No one doubts it. In another place I shall develop the origin of the language of signs. But have animals verbal language also? It is this which we are now going to determine.

The following is the manner in which C. G. Leroy expresses himself on this subject.

"We remark, in animals, only cries which appear to us inarticulate; we hear only the constant repetition of the same sound. Besides, we have some trouble to figure to ourselves a connected conversation between beings which have a long snout or a beak. From these prejudices, it is generally concluded that animals have no language, properly so called; that

words are an advantage peculiar to us, the privileged expressions of human reason. We are too superior to the beast, to seek to disguise to ourselves or to misapprehend what they enjoin, and the apparent uniformity of the sounds, which strike us, should not mislead. When a language, which is strange to us, is spoken in our presence, we think we hear only the repetition of the same sounds. Habit, and even the understanding of the language, alone teach us to judge of the difference. That difference, which the organs of the beasts make between them and us, ought to render us much more strange to them, and even make it impossible for us to recognise and distinguish the accents, expressions, and inflections of their language. It is however certain, that the beasts of each species distinguish very well among themselves, those sounds which to us appear confused. It does not happen to them to mistake in this matter, nor to confound the cry of fear with the sighing of love. It is not only necessary, that they express these marked differences, but also to characterize the slightest shades. The language of a mother who announces to her family, that they must hide, conceal themselves from the view of the enemy, cannot be the same as that which indicates that they must accelerate their flight. This is a question which must be resolved by the solution of two others. Have they the mechanism necessary for speaking? Can they without speaking execute what they do execute? Language supposes only a succession of ideas and the faculty of articulating. We have recognised, without being able to doubt the fact, that the beasts feel, compare, judge, reflect, conclude, &c. They have then, in regard to connected ideas, all which is necessary for speaking. With regard to the faculty of articulating, most of them have nothing in their organization which, as appears, should deprive them of it. We even see birds, otherwise so different from us, succeed in forming articulate sounds entirely similar to ours. Beasts have, then, all the conditions

which are necessary to language. But, if we closely follow the details of their actions, we see farther that it is impossible they should not communicate a part of their ideas, and should not do this by the aid of words. Their various agitations have different intonations which characterize them. If a mother, terrified for her family, had but a single cry to warn them of the danger which threatened them, we should see the family at this cry always make the same movements. But, on the contrary, those movements vary according to circumstances. Sometimes it is to take to flight, sometimes to hide themselves, another time it will be to present themselves in the attitude of combat. Since, in consequence of the order given by the mother, the actions are different, it is impossible but that the language should have been so likewise. Can it be said, that the expressions are not much varied between a male and a female during the period of their commerce, when we remark between them a thousand movements of a different nature? Eagerness more or less marked on the part of the male; reserve, mingled with enticement, on the part of the female, pretended refusals, vehemence, jealousies, reconciliation. Could it be believed, that the sounds, which accompany all these movements, are not as varied as the situations themselves, which they express? It is true, that the language of action is of great use among brutes, and that it is sufficient for their communicating the greater part of their emotions. This language, familiar to those who feel more than they think, makes a very prompt impression, and produces almost at the instant, the communications of the sentiments which it expresses; but it cannot suffice in all the combined actions of brutes, which suppose concert, convention, designation of place, &c. Two wolves who, in order to hunt more easily together, have divided their parts, one of whom has gone to attack the prey, while the other has charged himself with waiting at a given place to rein-

force his comrade with new strength, could not have acted together with so much concert, without communicating their project ; and it is impossible, that they could have done this without the aid of articulate language.

“The education of brutes is accomplished mostly by the language of action. It is imitation, which accustoms them to most of the movements, which are necessary to the preservation of the natural life of the animal. But, when the cares and the objects of foresight and fear have greatly multiplied with the danger, this is no longer sufficient ; the instruction becomes more complicated, words become necessary to convey it ; without an articulate language, the education of a fox could not be completed. It is certain from observation, that before having been able to instruct themselves by personal experience, the young foxes on leaving the burrow, for the first time, are more distrustful, and more cautious in the places where war is often made on them, than the old ones where the snares have never been spread. This observation, which is incontestable, proves absolutely the need they have of language ; for, without it, how could they acquire the knowledge of proper precautions, which knowledge supposes a succession of facts known, of comparisons made, of judgments rendered ? It appears then, that it is absurd to doubt, that brutes have among them a language, by means of which they transmit ideas, the communication of which is necessary to them. But the invention of words being limited by the need one has of them, we see that language must be very limited among beings, who are always in a state of action, of fear, or of sleep.”\*

When one has frequent occasions of observing animals, he learns to understand their language, and knows the different inflexions assumed by the cry of

---

\* *Lettres philosophiques sur l'intelligence et la perfectibilité des animaux*, par C. G. Leroy à Paris, 1802, p. 82, 87.



the cock, the chicken, and other birds, according to the sentiment or the idea which they wish to express. I saw a flock of ducks utter confused sounds with all the marks of inquietude; their singular movements fixed my attention; I could not doubt, that they were occupied with something which greatly interested them; their inquietude became every moment more visible; at length a duck, that had run from a distance at full speed, threw herself into the court. All her companions received her with marks of the most lively joy; all approached her, extended their heads towards her, stooping down, wagging their tails, and making a sort of reverence. The quacking became more and more animated, and all finished by retiring, much pleased, into their cover. Now, will any one tell me, that these ducks did not speak to each other? I am informed of all the wants of my dogs by the different sounds which they utter. My monkey manifests by sounds, always modified, the most varied wants, sentiments, affections, and ideas. There are none, even to my domestics, who do not understand his language.

This language is natural to animals; it is inherent in their natures; it is the same in all the individuals of the same species; every individual learns it, all speak it well, and all understand it perfectly. The attentive observer will easily convince himself, that this language is much more extended, especially in the more intelligent species, than is commonly supposed.

But what proves still more in favor of a faculty in animals for language, is their aptitude to understand the arbitrarily formed languages of mankind. All our domestic animals furnish evidence in favor of this last assertion. They learn to comprehend, not only insulated words or articulate sounds, but entire periods expressing several ideas. I have made, on this subject, many observations. I have often designedly spoken of objects which might interest my dog, avoiding to name him, and without allowing to escape any

intimation or any gesture, which could have awakened his attention. Nevertheless he expressed pleasure or chagrin according to the occasion; finally, he manifested by his conduct, that he had well understood that the conversation concerned him. I had brought a female dog from Vienna to Paris; at the end of very little time she understood French as well as German. I have assured myself of this, by uttering before her whole sentences in both languages.

It remains for me to examine to what extent comparative anatomy confirms these observations, by the examination of the cranium and of the head of animals.

*On the Organ of the Faculty of Language in Animals.*

In man, the brain, or rather the inferior anterior convolutions, which at present interest us, extend themselves, ordinarily, about two inches from the median line toward the right and left; in such a manner, that the whole width of the anterior inferior surface of the human brain is ordinarily about four inches. In the horse and the ox, it is nearly two and a half inches; and, in fact, the forehead of animals is much less broad than that of man. The whole of this cerebral mass, situated on the orbital plate and against the forehead, is composed of several organs, such as those of educability, of the faculty of localities, memory of persons, of words and of language, of the faculties of tones, of numbers, and perhaps those of order and time. Now, according as a species is found endowed with more or fewer of these organs, its cerebral mass will extend more or less on the sides, and the inferior anterior surface of the cranium will be more or less large. In man, the ball of the eye, or the orbit, except its external edge, is covered by the inferior convolutions of the anterior lobes of the brain, and the superior plate

of the orbit is very large, more or less extended toward the side, and more or less flattened or prominent, according as the convolutions are more or less large or developed. In the monkey, nature has remained faithful to the same type; but the anterior parts of the brain shrink much more than in our species; a much larger part of the eyeball is placed without the encephalon. The superior orbital plate is not only less in size, but also more spherical in the interior of the cranial cavity; the effect of which is, that, making allowance for proportion, the brain of the monkey terminates forward more in a cone or an oval, than that of man. Pl. LXXXIX. fig. 1. the interior of the base of a human cranium; fig. 2, open base of the cranium of the monkey, shows that the inferior middle convolutions of the anterior lobes are much more excavated, that is, much less developed toward the orbital plate, than in man. The orbits of the ape (*guenon*) and of the ourang outang are almost as deep as those of man; which proves, how much smaller the inferior surface of the anterior lobes is in these animals, than in man. In the papions, the mandrils, and the pongoes, more than half the eyeball is found outside of the brain. Compare the crania of man with the crania of all the species of monkeys; Pl. LXXV. LXXXVIII. with Pl. LXVII. fig. 1, the cranium of the pongo, fig. 2, cranium of the papio, and Pl. LXXIX. fig. 1, the cranium of the sagouin, fig. 2, the cranium of the capuchin monkey, fig. 3, the cranium of the troglodyte monkey, fig. 4, the cranium of the ourang outang. Compare the brains of the patas monkey and of the ourang outang, Pl. XXXIV. and Pl. LXXVII. the brain of an ape (*guenon*), fig. 1, with all the plates of the human brain.

In the dog, it is only the posterior internal part of the ball, which touches the brain; more than two thirds of the eye are found placed outside of the encephalon. In several other animals, the whole ball is found outside of the brain, and more forward. This

takes place in the badger, the beaver, the pig, for the part of the cranium which, in these species, seems, at first view, to constitute the superior orbit, forms, in fact only the frontal sinuses. See Pl. LXVI. LXX. LXXII. the two heads of dogs, LXXXI. fig. 1, and fig 2; in general all the heads, and, Pl. XXXIII. the brains of the kangarou, fig. 3, of the tiger and lion, fig. 4, and 5, Pl. III. the brain of the calf; Pl. XIV. the brain of the sheep; Pl. LXXVII. fig. 2, the brain of the cat.

In birds there is always as much more of cerebral mass placed above the internal part of the ball, as the species has more aptitude for language. Compare Pl. LXXXI. fig. 3, the pie; fig. 4, the starling; fig. 5, the great raven; fig. 6, the parrot, with the gallinacea, Pl. LVII. and the brain of the chicken, Pl. I. fig. 2.

This small number of examples will enable the reader to conceive, not only, that animals may have among them a determinate language, but also how they are capable of comprehending those arbitrary sounds, which compose our languages, how they are competent to seize a series of ideas expressed by a period.

It even appears, that the aptitude for language, possessed by animals is destined, not only to subserve their proper wants, but also to render them capable of understanding the signification of sounds, and the language of other animals and of man.

### *Philosophical Reflections on Spoken Language.*

Since Condillac, philosophers have exhausted themselves in reasonings on the influence, which signs in general, and spoken language in particular, exercise on our ideas and our knowledge. They maintain, that, without signs we should hardly think; that it is only articulate words which can lead us to abstract ideas; that signs and language develop our faculties, give birth to our inclinations, our sentiments, affections,



passions; that, without signs, we could not compare our simple ideas, nor analyze our compound ones; that in this way, languages are as necessary to thought as to speech, to the possession of ideas as to their expression: that without language we should have only very few ideas, and these very confused and incomplete.

It happens, by a fatality common to philosophers, and which happens to physicians and all others, to take the symptoms for the disease, the shell for the fruit. Destutt Tracy has already said, that Condillac should have announced his discovery differently, and have said, that every sign is the expression of the result of a calculation executed, or, if you will, of an analysis made, and that it fixes and establishes this result, in such manner, that a language is really a collection of discovered formulæ, which afterward facilitate, and marvellously simplify the calculations and analyses which we wish to make ulteriorly. In fact, all possible signs, the language of gesture as well as verbal language, are the product of the activity of the faculties, inclinations, affections, and passions of men and animals. It is in the nature of man and animals to produce certain sounds as soon as they are affected; as soon as the experience they necessity of communicating with their fellows. It is an effect so necessary to their organization, that it even takes place in spite of us; and these seem almost always to depict our various affections so well, that they become the most certain and the most distinct natural signs. Before all language, the organs of our qualities and faculties are active, and however little this action may be felt, it manifests itself either by gestures, or by sounds, or words, or by both in combination. It follows, that these external signs, for the most part, are proportioned to the action of the internal faculties; it is by means of language, that man and the animal communicate their feelings and their ideas; and consequently the language of each species of animal, of each people, of

each individual, must be more or less rich and just, according as the sentiments and the thoughts are more or less numerous, clear, lively, and determinate. Any language whatever can never have more signs, than those who form it have ideas or sentiments. Languages and knowledge always are in concert ; and in their progress, the equilibrium always establishes itself between the interior faculties and the signs. In order to transmit to my hearers or my readers, in a clear manner my ideas and my feelings, I try to impress myself with them, to personify them, if I may be permitted to use the expression, and the proper language spontaneously presents itself. This is the reason why the most perfect language is always employed by the most profound and enlightened men ; and whenever language is poor, vague, imperfect, vacillating, the sentiments and the course of the ideas are open to the same charge. The language of brutes is, for the same reason, very limited ; and thus it may be conceived, why that of certain savages is composed only of three hundred words. The words are created only in proportion to the need we have of them.

The doctrine so pompously announced, therefore, is false ; namely, that language, that signs in general, have called forth, directed, and fixed the progress of the human mind in its combinations and researches. I admit, that the history of signs is, at the same time, the history of the successive advancement of human knowledge. But it is knowledge, inclinations, sentiments, talents, which have produced the signs ; never could any sign give rise to any inclination, sentiment, or talent. It is necessary first to have experienced these, and then to have found the acceptation of the word or sign invented by others. Speak of metaphysics in the most distinct terms to an animal, an idiot, a man of very limited powers, and it is talking of colors to a blind man. Boast to a miser the pleasures of beneficence, to a cruel man, the charms of compassion ; you will never, with all your signs, awaken

benevolence in the miser, or humanity in the cruel man.

Verbal language, it is true, is, of all languages and of all possible artificial signs, the most convenient to employ ; it needs neither instruments nor preparations as for traced figures ; it requires neither space nor freedom of limbs as for gestures ; in whatever position one is, maimed, sick, acting, he can produce this language. It is heard as well by night as by day, at a distance as well as near, without disturbing one's self, without turning toward the speaker, without being earnestly attentive, without even wishing it. These properties, which sounds possess, of being the most natural and the most convenient of all signs, cause them to become by custom the most habitual of all, and within us they are the most intimately connected with the ideas which they represent.

It is also true, that sounds have the very precious property of being able to become permanent signs by means of writing ; that they remain fixed under our eyes, like hieroglyphics, drawings, and all other durable signs ; and can, like them, awake in us, constantly, the ideas with which we have been transiently affected, and recall to us those which we may have forgotten, and which serve as necessary connections with others.

Notwithstanding all these advantages, so well detailed by Destutt Tracy, it must be confessed, that the language of gestures, though destitute of some of these properties, is more natural, more intelligible, more universal than spoken language, and that the language of actions or of gestures, is anterior to spoken language, &c. The immense utility of the language of gestures I shall make evident, when I have occasion to speak on *pathognomony* and *mimickry*.

The cases of disease, which I have quoted above, in which the patients had full knowledge of things, without being able to find or pronounce their names, prove, that the action of the internal forces precedes signs ; that it is, in some measure, independent of

these ; and, finally, that arbitrary signs, like spoken language, can give rise to ideas and sentiments, only so far as they have become by use means of association.

If it were true, that without signs, we should hardly think, and that nothing but articulate words can lead us to abstract ideas, then children would scarcely think before knowing how to speak. Now, experience shows that, before speaking, children acquire an infinity of notions, which without thinking, would be impossible. Children even commence the operations of their intelligence by making abstract ideas for themselves. Without stopping at the shades of color, all these shades are referred to the abstract idea: they are all green, red, blue, &c. The young of animals, the calf, the foal, &c. are the offspring of the cow, horse, &c. Thus, abstraction is the first want of the understanding, and is effected without the aid of any language.

It is likewise proved by experience, that, when an individual has been deprived of hearing, he employs other signs, natural or artificial, to express his sentiments and his thoughts. Men have at length seen the fallacy of the opinion, refuted many centuries since, that persons, deaf from birth, are not susceptible of the same sentiments, ideas, acquirements, as those persons who hear. The attainments of the deaf, unless their intelligence is imperfect, are often more just and more precise than the vague and indeterminate knowledge of other persons. The instruction of these is too often given in ill understood, ambiguous terms ; the instruction of the deaf, on the contrary, always commences with the objects themselves ; the deaf man will never persuade himself, that he has a positive idea of spiritual things ; he knows very well, that whatever he learns of them is founded on negations, because he has been made to conceive, for example, that spirit is not an extended body, that it is not matter without action, &c. For the rest, every body knows the precision of their ideas on the affections, the sen-



sations, the sentiments, and the passions, and with what rapidity they communicate together before having received the least instruction.

Spurzheim saw a young Scotchman, born *deaf* and *blind*, who, though deprived of these two principal means of communication, and without having received any education whatever, manifests moral or affective qualities and intellectual faculties, to a higher degree than many other individuals endowed with all the external senses.

This fact is too important to be omitted. I shall relate it, as Spurzheim has reported it in his Phrenology.

“ The history of James Mitchell, a young Scotchman, born deaf and blind, furnishes us an evident proof, that the five senses do not procure us our affective and intellectual faculties, and that they are only intermediate instruments. On account of the importance of the fact, and because I have myself seen this young man, I will speak of him with some detail.

“ He was born the 11th Nov. 1795, deaf and blind, of intelligent parents. It may be conjectured, that he perceives sounds internally, for he appears to experience pleasure in moving hard bodies against his teeth; he has been seen to do this for whole hours. He has always seen the light so far as to distinguish day from night, and dazzling colors; and amused himself in his youth with looking at the sun through the clefts of the door, and with kindling fire. At the age of twelve years, the drums of both ears were perforated, one by Sir Astley Cooper, the other by Mr. Saunders, but without any improvement of the hearing. At fourteen years, Mr. Wardrop performed for him the operation of cataract on the right eye; after this he recognised more easily the presence of external objects, but never made use of sight to distinguish the qualities of bodies. Before and after this period, the colors of red, white, and yellow particularly fixed his attention. His senses of relation were always smell and touch. At present, he recurs to smell less than

formerly ; he turns bodies with quickness in all directions, and turns the head sideways in the same manner as other blind men. His desire to know external objects, their qualities and uses, has always been great ; he examines all that he meets, men, animals, and things. All his actions indicate reflection. One day, the shoemaker brought him a pair of shoes too small ; his mother shuts them in a neighbouring closet and takes out the key. Some moments afterwards Mitchell asks his mother for the key, turning his hand, as if in opening a door, and pointed to the closet. His mother gives it to him ; he opens the door, brings the shoes, and puts them on the feet of the young boy, who accompanied him in his excursions, and whom they fitted very well.

“In his childhood, he always smelled out the persons whom he approached, carrying their hands to his nose and drawing in the air. Their odor determined his affection or aversion, in the same manner, as persons, endowed with the sense of sight, are attracted or repelled by a handsome or ugly person. He always knew his clothes by the smell, and refused to put on those of another. Bodily exercise always amused him, such as rolling himself from the top to the bottom of a hill, turning a somerset, making wood or other objects float down a brook, which ran past the house of his father, picking up round and smooth stones, which he found on the bank, arranging them in a circle, and placing himself in the midst, or building houses with pieces of turf, in which he left openings, probably to imitate windows. Since he is able, by the aid of his right eye, to distinguish objects better, he is bolder in his excursions. He goes alone the distance of twelve Scotch miles, from Nairn to Fort Georges. He passes the greatest part of the day in the fields and on the road ; but returns at the hours of meals.

“The traits of his countenance are very expressive. In general his natural language is not that of an idiot,

but of an intelligent being. When he is hungry, he carries his hand to his mouth, and points to the closet where the eatables are shut up. When he wishes to lie down, he inclines his head on one side on his hand, as if he would place it on his pillow; he imitates the motions of artisans in referring to them, as the movements of a shoemaker, who draws his thread by extending his arms, or of a tailor in sewing. He loves to mount on horseback; he designates this exercise by joining his hands and placing them under the sole of his foot, no doubt to imitate the stirrup. He makes, like every body else, the natural signs, for yes and no, with his head. He does not like any one to kiss him on the face, and if his sister does this in sport, he wipes and rubs himself with a discontented air. It is remarkable that almost all the signs, which he invents, are calculated for the sight of others. He appears to know his own inferiority in regard to this sense. Formerly he was accompanied by a little boy in his excursions; he went where he wished, but if he met any object, which seemed to him an obstacle, he waited for his companion to come up.

“He easily recalls the signification of the signs made to him. To make him comprehend the number of the days, they incline the head to him, to intimate that he must lie down so many times before the thing takes place. Approbation is manifested to him by caressing his shoulder or arm, and disapprobation by striking a slight blow. He is sensible to the caresses and the satisfaction of his relations. He loves young children, and takes them in his arms. He is naturally good and offends no one, yet his temper is not equal. Sometimes he loves to have others play with him, and breaks into bursts of laughter. One of his favorite amusements is to shut up somebody in a chamber or in the stable; but if others thwart him much, or too long, he becomes angry, and utters very disagreeable cries; in general, he appears contented with his situation.

“He has natural courage, but has always acted with prudence. When young, he wished every day to go farther than he had done the day previous. One day he found in his way a narrow bridge of wood, which was over the stream near his father’s house ; he places himself on his hands and knees to pass it. His father, to intimidate him, sends a man to make him fall into the water, at a place where there is no danger, and immediately to draw him out again. This lesson produced the desired effect, and he passed there no more. Some years after he still remembered this punishment. One day, being vexed with his little companion, while they were playing in a boat tied to the bank, he took him, plunged him in the water and drew him out again.

“He fears the perils of fire, water, and cutting instruments. Animals killed, such as fowls, never made a disagreeable impression on him ; but when he touched the body of a dead man, (it was his father,) he retired terrified and with precipitation. Since then he has touched other bodies, without experiencing the same emotion ; he knows that they are interred, and his sign to express it, is to carry his hand towards the ground.

“He is afraid of dying, and knowing that people die in bed, he never remains lying when sick ; and having remarked, that the dead are covered with white cloths, he is uneasy in sickness, if dressed with white linen. The death of his father has given occasion to observe his attachment to his parents. When the coffin, which enclosed the body of his father, was exposed before the door, previous to interment, James went out of the house with precipitation snuffing the air about him, probably to guide himself ; he approached the coffin, threw himself on it, and pressed it in his arms, while his whole countenance indicated the greatest sorrow. At the moment when they wished to remove the coffin, he threw himself on it anew, held it, and they were obliged to tear him from



it by force. Some time after, his mother being indisposed, he shed tears. Every time that any one of the family is absent, he manifests uneasiness. During some time he had a disease in one foot, which was placed on a stool. A year after, observing, that the boy, who usually accompanied him, did not leave his chair, he touched his legs, and finding a bandage, he went to the barn, and looked for the stool to put his friend's foot upon it. In 1814 he was attacked with acute rheumatism. He loves particularly his eldest sister, and prefers her to every other person. An aunt, to whom he was also attached, came to see them. At this time his sister fell sick and was obliged to keep her bed; Mitchell manifested uneasiness, and wished to know what had become of his sister; he made a sign, that they should lead him up stairs, for his sufferings would not allow him to walk alone. Having found his sister in bed, he experienced pleasure in pressing her hand; but after descending into the parlour on the ground floor, he no longer wished to have his aunt remain near him; he always made signs, that she must go up stairs, desiring, without doubt, to express, that she ought to go and take care of his sister. In my work on *Madness*, page 132, I have related this fact; but by mistake I stated, that it was the aunt who fell sick. It is true, that this circumstance is not essential; yet, through love for truth, I think it my duty to state the fact as it occurred.

“It is difficult to say whether he experiences religious sentiments; he accompanies his parents to church, and is accustomed to place himself on his knees during the prayers of the family. He conducts himself decently; but is this from custom, or through devotion? He knew that while they were on their knees, his father had a book (the Bible) before him. Three months after the death of his father, one Sunday, when a clergyman, who had assisted at the prayers of the family while his father lived, was at the house,

Mitchell brings him his father's Bible, and makes a sign to all the family to put themselves on their knees. It is certain, that he experiences the sentiment of justice and injustice. He is troubled every time he has offended his sister or his mother ; and caresses them to regain their affection. His sentiment of self-love, or personal dignity, is evident ; for, he would not take his regular meals in the kitchen where the servant is, but in the chamber, in presence of the family ; yet, if he returns before the dinner hour, he will go and ask a potatoe of the cook. His love of approbation is very decided. He likes to be caressed. He gives the preference to well dressed persons ; and, if he has new clothes, will not change them for the old ones. Several times he has thrown into the river his old clothes, or shoes, to prevent his parents from making him wear them. Sometimes, in great anger, he has also torn his clothes. They wished to teach him to make baskets, but the sedentary life displeased him, and, as the employment wearied him, he threw the materials into the fire. Destruction therefore serves him as a means to rid himself of disagreeable things. A neighbour taught him to smoke, and this taste became very strong with him. Every time he emptied his earthen pipe, he broke it. They gave him a more durable pipe, but he refused it the second time. They allow him at present daily, four supplies of tobacco, and two new pipes ; so that each pipe serves twice ; after that, it is broken. This enjoyment sometimes calls forth his cunning. One day his sister makes him a sign to go and buy two pipes. In returning he brings one in his hand, and gives it to his sister ; she gives him to understand, that he ought to have two. At first he makes believe, that he does not understand her ; but when his sister urges him to go and find the other pipe, he draws it out of his pocket with shouts of laughter. Several persons of the city of Nairn, who know his taste for tobacco, furnish it to him. On returning to the house, he never shows it till after having received from the family his daily ration.

“I shall finish what I have to say of this singular being, by speaking of his sense of property. One day he meets on the road a man mounted on the horse, which had been bought of his mother some weeks previous. Mitchell according to his custom touches the horse, appears to recognise him instantly, and makes a sign to the rider to dismount. The latter, in order to observe his intention, obeys, and sees with surprise, that Mitchell leads the horse to his mother’s stable, takes off his saddle and bridle, gives him oats to eat, retires, shuts the door, and puts the key in his pocket.”

It is impossible to have a more certain proof of innate dispositions, and of the insufficiency of external instruments. This young man is deprived of the two principal senses of relation; he has received no education, does not understand the artificial signs calculated for the hearing and sight, and yet manifests the affective and intellectual faculties in a high degree; while many other persons, who enjoy all the external senses in perfection, are very limited in their mental manifestations, or are even idiots.

From all which I have said in regard to the sense of languages, I think myself authorized to infer, that verbal language, considered as a cause, is by no means in so close connexion with our faculties as philosophers pretend; that it is rather an effect, a creation of our internal faculties; and finally, that a particular organ of the brain presides over this admirable function.

“One might easily conceive,” says Demangeon, “the different species of memory already admitted by the ancients, without so great a number of organs. Memory would be almost limited to words, with faculties very few in number, or little developed, as in children, parrots, and other animals; with faculties more numerous or more developed, it would extend itself to things, places, numbers, &c. Thus, without denying, that the angular form of the exterior of the orbit sometimes is the indication of aptitude for calculation, that

the prominence of the eyes in man is a sign of verbal memory, or that the swelling of the internal and superior part of the arch of the eyebrows, indicates the sense of locality, which constitutes already three sorts of memory, I think our authors have multiplied organs too much, and have often endowed them with a speciality of function, which they do not possess. Such, among others, is the organ of aptitude for philology or languages, which can only be learned by means of several faculties.

“Of what species was the memory of the Italian Magliabecchi, who, having read a manuscript, which, in order to try him, they pretended to have lost, dictated it from memory without missing any thing? It is also related that Frederick II., king of Prussia, one day confounded Voltaire, who came to read him a piece of verse of his own composition, without having yet communicated it to any body, by telling him, that this piece was not his, that he knew it already, and could even call some one who had learned it by heart, at the same time introducing a man of his court, who repeated it without forgetting any thing, after having heard it once only, while concealed behind a curtain. Is this the simple memory of words; or is there a memory of phrases, of verses, of rhymes, construction, style, &c.? By the force of what organ do the mocking birds reproduce, not only the words of different languages, but even the notes of other birds and the cries of several animals? If it is by means of the two organs of verbal memory and of imitation, why cannot man, who has these two organs, equal them in the reproduction of the same phenomena?”

Demangeon always holds to his idea on the results of the enlargement of the brain in general, without having regard to the favorable development of certain cerebral parts; and while ever complacently giving himself to reasoning, he has the appearance of forgetting facts, of which, however, the reading of my book might have furnished him a very large number.



I have instanced bees, which, with an extremely small cerebral mass, have an astonishing local memory. I have cited pigeons, dogs, horses, &c., which, having hardly the tenth, or even the hundredth part of the human brain, have local memory, or the faculty of guiding themselves, to a degree infinitely higher than men. I have even instanced imbecile persons, and idiots, who excel in the memory of persons, places, music. I have cited great mathematicians, geographers, mechanics, musicians, philologists, whose other faculties were very limited. On the supposition of Demangeon, every great compiler of dictionaries, of grammars, every great musician, mathematician, &c. ought to be at the same time a great poet, metaphysician, warrior, actor, &c. In general, every considerable volume of the brain ought to have, as its result, moral qualities and intellectual faculties very energetic. Is not Demangeon in contradiction with himself, when he maintains that mocking birds reproduce, not only the words of different languages, but also the notes of other birds, and the cries of several animals, and that man cannot equal them in the reproduction of the same phenomena?

Demangeon asks, of what species was the memory of the Italian Magliabecchi, &c. I answer, let him again read my own passage in my large work, T. iv. p. 70, where I have myself related the mystification of Voltaire by the king of Prussia, and he will find, that I attribute the faculty of retaining phrases, with so great a facility, to the memory of words or verbal memory.

#### XVI. *Faculty of distinguishing the Relation of Colors ; Talent for Painting, (Farben-sinn.)*

By the expression, faculty of distinguishing the relation of colors, I do not mean to designate the simple faculty of seeing or perceiving colors. Animals also see

different colors; they are susceptible of illusions produced by the employment of colors, of light and shade. I have seen dogs bark at the portraits of persons, who were unknown to them, which they perceived by chance in an apartment, and give marks of affection to the portrait of their master; but it will be difficult to find examples of animals who have shown, that they had a perception of the harmony or want of harmony of colors.

There are persons who are incapable of perceiving a very marked difference between one color and another. Dr. Unzer, of Altona, never was able to distinguish the difference between green and blue. A boy, who wished to learn the trade of a tailor, was obliged to renounce that design, in consequence of his incapacity to distinguish certain colors. Spurzheim cites the case of a man whom he saw at Dublin, who loved the mechanic arts and drawing, especially that of landscapes, but who was obliged to abandon painting, because he could not distinguish red from green. At Edinburgh, in Scotland, he also saw three brothers and a cousin german of theirs, who cannot discern green from brown. Such persons certainly are not made for painters. There are other persons, on the contrary, who discern the most delicate shades, and who have a peculiar tact, by the aid of which they are capable of arranging colors to please the eye. But these advantages, though necessary to the painter, have nothing in common with the true talent for painting. By the expression, faculty of distinguishing the relations of colors, I mean the faculty of judging the harmony and contrast of colors, of perceiving and judging of their laws, and conforming to them in their employment.

It is this faculty of distinguishing the relations of colors, which constitutes the talent of the painter. I do not here speak of the painter as an artist, nor under the relation of composition, nor under the relation of drawing, nor that of expression; I speak of the painter only so far as he is a colorist.

In speaking of the functions of the senses, I have already proved, that the talent of the colorist does not at all depend on the eye. The most perfect eye is sometimes found the property of the most indifferent painter, and there are examples of excellent colorists who had weak sight. Before the cerebral organs were thought of, men were doubtless compelled to deduce all our qualities and all our faculties, from the five senses. In this system, painting also could only be a product of the eye, I might quote, in favor of this error, several authors who have written on painting; but I content myself with relating what Sobry says on this subject, who has explained, better than any one else, the opinion of his contemporaries.

"It is not enough," says he "that the sense of sight should be useful to man; it is not enough, that it should be indispensable to him; nature has wished, that it should also be a source of pleasure; she has wished, that it should be the source of his most constant, sweetest, purest enjoyments. In distinguishing man from all other animated beings, in this respect, she has ordained this sense to be the principle of one of her most moral enjoyments.

"In fact we do not see, that animals extend the use of the sense of sight much beyond its utility to them; a fine situation, agreeable places, objects well arranged, appear to affect them but little; the bird seeks, without choice, the foliage in which he conceals himself: the fallow deer, the cave which shelters him; the domestic animal, the asylum which receives him; no one appears to take either more or less interest in the sight of the things which surround him, and it may be said, that, for all animals, the sense of sight is bounded absolutely by its physical character.

"It is to man alone, that it has been given to have moral enjoyments through the sense of sight, independently of the physical means of this sense, with which he is so liberally provided for his advantage. So that it may be said, that, if the sight of man is limited to a

certain number of objects, as regards utility, it embraces an infinite extent of them, as a source of delight.

“From the pleasure of seeing, springs the desire of representing to one’s self what has been seen; hence reiterated attempts to trace objects; hence the gradual success of the enterprises of drawing and painting; arriving, from rude beginnings, to satisfactory productions, and finally to a perfection approaching to illusion.”

But it is precisely from the circumstance, that animals, notwithstanding the perfectibility of their eye, remain insensible to the fields enamelled with flowers, and to all the beauties of nature, that we ought to infer, that neither the pleasure caused by the sight of these objects, nor the judgment which the mind passes on them, enters into the sphere of the activity of the eye. It ought to be felt, that, though the eye transmits to the soul the impression of these objects, there are nobler objects, which set this impression at work for more elevated ends. Indeed, the talent of the colorist is founded on a faculty much superior to that of seeing. It is founded on the agreement of an internal sentiment and an act of the intellect, with the laws of the proportions of colors, such as they exist in the external world. Let me explain myself.

The internal man and animal are formed for the external world; their interior organization ought, therefore, to be found in unison with external objects, inasmuch as the animal and the man must have points of contact with objects from without. Their organs of taste and smell are in unison with the substances which are appropriate to their nourishment. In the same manner all the cerebral or internal organs are adapted to external objects. The animal has the instinct of propagation, and their exist males and females; the instinct of the love of offspring, and it finds its object in children and young ones; the faculty



of distinguishing localities, and it finds its application in the relations of space.

There must exist likewise, in the external world, objects on which the faculty of colors can be exercised. The laws of the proportions of colors have not been invented by man; they exist in creation; man, and probably he alone of all animals, is endowed with an organ, by the aid of which he recognises these laws; that is, this organ and these laws are in direct relation: the action of the organ becomes a revelation of these laws; the organ bears the impress of the laws to which the proportions of colors in the external world, are submitted.

### *View of the Laws of the Proportions of Colors.*

I pass over in silence all that Newton, Buffon, Goethe, and the modern natural philosophers, have said on the proportions of colors and on their mixture. I likewise abstain from examining the question, whether there exist seven primitive colors, or three only. I have no other end but to convince the reader, that there really exist, out of ourselves, determinate laws for the proportions of colors. Thus, for example, the three fundamental colors, supposing them to be only three, when placed side by side are always inharmonious. Blue, yellow, and red are inharmonious. If two of these colors are mixed, a mean color ensues. Blue and yellow compose green; blue and red, violet; red and yellow, orange. To obtain harmony, we must place by the side of a primitive color, a mixed color, in which the primitive color enters as part of the mixture; the mixed color will always be in harmony with the two primitive colors from which it results. Place a riband of silk, of one of the three primitive colors which I have named, and nearly an inch wide, on a leaf of white paper, and look at it attentively; at the end of some

instants, there will be seen the three primitive colors, and by their side the mixed color, resulting from the two last primitive colors. If, for example, we place on the paper a blue riband, there will be seen beside, the yellow and the red, and by their side the orange, resulting from their mixture.

Klotz, at Munich, is entirely satisfied of the internal laws of colors. It is on these laws, that the possibility of the scale of colors rests; and if we ever are enabled to represent these laws of the proportions of colors by signs, as we do those of the proportions of sounds, we may hope to preserve pictures from the scythe of time. We might then note a picture of Titian or Rubens, as we do a piece of Mozart or Grétry, and reproduce masterpieces of the pencil, as well as those of musical composition, after the lapse of many ages.

The most recent experiments of naturalists on colors, made by the aid of a certain number of superimposed transparent laminæ, give still more precise ideas on the laws of their proportions.

He, who, by virtue of his organization, is capable of seizing these laws, is from this circumstance susceptible of feeling the harmony, or want of harmony, existing between colors. He, in whom this organization is developed in a high degree, has a natural and lively impression of this harmony; without having learned these laws he divines them; wherever he meets with colors, he passes judgment, without knowing how or why, on the harmony or the want of it existing between the colors. This is the talent of the painter, so far as he is a colorist. This is what determines the vocation for painting. This talent, it is true, may be perfected by the study of rules and models, and thus become an object of intelligence; but it would not exist without that revelation, which comes from the activity of the organ, and constitutes its natural foundation.

*Talent for Painting in Mental Alienation.*

In Pinel's establishment, a sculptor gave himself up to all the extravagance of rage in his cell; he tore every thing to pieces, and continued several months in a most violent state of mania. Calmness at length succeeded, and his freedom was given him in the interior of the hospital; his understanding was still feeble, and he supported with difficulty all the weight of an inactive life. The art which he had cultivated seemed to smile in his imagination, and he desired to try himself first in the class of portrait painting. They readily seconded him in his design, and he made the sketch of the portraits of the Superintendent and his wife. The resemblance was well caught; the patient soon had a relapse, which terminated his miserable existence.

My readers will no longer doubt, I suppose, that the faculty of colors is a fundamental faculty founded on a distinct cerebral organ.

*Of the Organ of the Faculty of Colors, and of the external Appearance of this Organ.*

At Vienna, I never lost sight of the difference of the talents which constitute the art of painting, and I observed with very particular attention the painters who distinguished themselves for coloring; for example, Lamby. In all of them I remarked, that the frontal part, situated immediately above the middle of the eye, advanced into an arched prominence; the whole arch, and especially its external half, was directed upwards in such a manner, that the external half of the superciliary ridge was more raised than the internal.

I have only been able to discover the seat and form of this organ, by observing attentively very distin-

guished colorists, and I made the discovery at a period, when I had not the least idea either of the form or of the direction of the individual cerebral convolutions. Afterwards, however, an attentive examination enabled me to discover, in the region indicated, a little convolution projecting outward, having from half an inch to an inch of transverse diameter. It is the convolution XVIII. Pl. IV. V. XIII. the favorable development of which determines the faculty of distinguishing the harmony and disagreement of colors.

I have found this discovery confirmed in all my travels. We have seen, in a passionate amateur of coloring, a collection of portraits of all the famous painters of both sexes, who have distinguished themselves in this department of the art. In all these portraits, we found the region immediately above the middle of the eyebrows, extremely prominent.

We were especially struck by a bookseller at Augsburg, blind from birth, who maintained, that it is not the eye but the intellect, which recognises, judges, and creates the proportion of colors. This man even assures us, that, by means of an internal sense, he has precise notions of colors, and it is a fact that he determines their harmony with exactness. He has a great number of pearls of colored glass; he forms with them different figures, and the arrangement of the colors is always harmonious. He tells us among others, that, whenever he takes much pains to arrange the colors of a ground, he feels a pain immediately above the eyes, especially above the right eye. The region which I have above indicated is considerably developed in this man.

“Devoyer, born nearly blind, who has never seen paintings, except with the aid of a glass, passes for a connoisseur.”

Now compare the greatest painters, who have excelled in coloring, with other painters equally distinguished, but who, in regard to this point, have not equalled the first. Compare Titian, Pl. LXXXV. fig. 2;



Correggio, Rubens, fig. 3, Claude Lorraine, Van-Dyke, Paul Veronese, Giorgion, Rembrandt, fig. 4, Teniers, le Tintoret, with le Poussin, Lesueur, Raphael, fig. 5, Michael Angelo, fig. 6, Lebrun, Jouvenet. In the portrait of the first you will always see the superciliary ridge strongly raised in the middle ; in the last, on the contrary, this ridge has almost a horizontal direction ; from the root of the nose to near the middle of the superior arch of the orbit, it is flattened or depressed ; while in the first, this region becomes more and more prominent as it approaches the middle of the superciliary ridge.

The organ of the sense of colors is usually more developed in women than in men. Hence it happens, that the eyebrows form, generally, an arc of a circle in women ; this explains why they are more susceptible than men of receiving an agreeable impression from a happy choice of colors ; why they are so much pleased with a dress of various colors, and why they are more frequently than ourselves, lovers of flowers. A woman will always prefer, whether for herself or her friend, a colored portrait to a bust. This shows why female artists, who in every other respect rarely equal men of genius, raise themselves sometimes to the level of the most distinguished painters in the art of coloring. Angelica Kauffman, daughter of the celebrated Ruisch, is an example of this.

The faculty of colors explains several phenomena, which would remain for ever inexplicable without organology. I confess, that to speak pertinently of all the objects which enter into the domain of the physiology of the brain, I should have to make treatises much more complete than my work permits ; I should need almost universal knowledge, an impossible thing, but which must one day engage the connoisseurs to make application of organology to every individual part. I will furnish, meanwhile, a little extract from observations which Dr. Gambs, of Frankfurt, has had the politeness to communicate to us.

"If," says he, "we direct our attention to painters in general, we shall observe two clases of them, essentially distinguished from each other. The first is formed by the historical painters; the second by the landscape painters, to whom we must add the painters of animals, flowers, and fruit; all those, in fact, who copy from nature. It is to be remarked that the first, who make a study especially of anatomy, history, antiquities, the works of the ancient and modern masters, who consequently are obliged to study nature and art at the same time, need, to a greater degree than the second, a taste for the arts, and consequently the organ of the arts, of which I shall speak hereafter, ought to be more developed in them.

"This organ of the arts, being placed at some distance from the organ of the faculty of colors, is a circumstance, perhaps, which explains, why the painters of history have rarely been good colorists; why some among them, as Michael Angelo and Poussin, have even neglected coloring, which they professed to consider the least essential part of painting, while their merit in regard to drawing, invention, expression, and composition, places them in the rank of the first historical painters.

"If, on the contrary, we observe attentively the landscape painters and the painters of portraits, who in the exercise of their art especially need the faculty of localities and that of persons; if we observe attentively, that the organs of these two faculties are very near that of colors, we shall perceive why, in the number of landscape and portrait painters, there has always been a great number of excellent colorists, who in this department, have surpassed almost all the painters of history. Compare the excellent landscapes of Claude Lorraine, of Schwanenfeld, of Ruysdael, Both, and others, with the works of the first painters of history, and you will easily be convinced of this truth.

"2. Climate appears to exercise great influence on

the organ of the faculty of colors, as well as on other organs. Almost all the Italian painters, though surrounded by the most beautiful nature, are so indifferent in regard to coloring, that, if we except Annibal Caracci and Titian, both colorists of the first rank. Italy does not possess a single landscape painter equal to Claude Lorraine, to Schwanenfeld, or to Ruissdael, and to other Flemish painters. Holland, Germany, and even the North, on the contrary, have produced a great number of excellent landscape painters, but a very small number of good historical painters. Spain and Portugal have excellent painters of history; for example, Velasquez and others, but not a single landscape painter. In the Italian school, the Venetians, placed more toward the north, are almost always the best colorists. The French school is reproached with being a mongrel, which takes the middle stand between the Italian and the Flemish; it is even predicted, that it will never produce a Raphael, a Titian, a Paul Veronese, a Correggio; it is generally maintained, that the French are endowed with the faculty of arts and of that of colors, to a less degree than the Italians and the Flemish; that the greater part of their historical paintings are also hard, and want natural character as much as their music; and that we cannot acquit the greater part of their paintings of the fault of bad coloring."

I imagine, that custom and natural feeling have much to do with these criticisms. I am neither an artist nor a good connoisseur, but it seems to me, that the new French school has some masterpieces to oppose to its detractors, and that the names of the Gerards, Guerins, Robert-Lefevres, Girodets, Vernets, Forbins, Davids, Regnaults, of the excellent colorist Gros, &c., ought to place them in the first rank among the modern schools. But I repeat it, I consider myself incompetent to decide this controversy.

Neither will I undertake to decide, as some have done, how far the narrow forehead, more prominent in front

of the Dutch and Flemish, explains the greater activity of their organ of the faculty of colors. To determine the question with a knowledge of the cause, I ought to have compared, not only the foreheads of different nations in general, but also to have studied particularly in them, the organ of the sense of the relation of colors.

The different degree of talent for painting, in different nations, reveals itself even in their drawings and engravings. The drawings of the Flemish, even those by the pen, are always, in regard to shades, more finished than others, and exhibit masses of crossed lines by which the artist has intended to give them the appearance of coloring. Many are retouched with india ink, or offer white lights on dark ground. The Dutch landscape painters, properly so called, have been in the habit of coloring their landscapes *in gross* after nature, on the spot, or at least, of taking a colored sketch of them.

In the first engravings of the Dutch and German artists, we cannot mistake the intention of the engravers to imitate colors. The Italian engravers, on the contrary, from the origin of the art to our day, have never been able to imitate them by giving to their works the perfection of retracing the colors, as Reubens and his pupils did, and as the superb dog of Golzius shows.

The organ of the faculty of coloring is pretty generally much developed among the Chinese, whatever may be the variations which the form of their head undergoes. It is for this reason, that their superciliary ridges are strongly drawn upward, especially in the external half. Every body knows to what degree they are prodigal of colors. Every part of their houses is covered with them; the columns, the entablatures, the friezes, all is painted in green, blue, red, yellow; they paint even their statues; they surpass all the nations of Europe in the art of dyeing.



According to the different degree of activity of the organs of the faculties of localities, of the arts, colors, the taste of those who make collections of objects of art, or who consider themselves critics, must modify itself variously. John Fuseli has written a journal of the arts, in which, in criticising works, he gives proof of an exquisite faculty of the arts, but of a very defective one of colors. There are other critics whom nothing escapes which has relation to coloring, but who pay no attention to bad composition, to a drawing so incorrect as to revolt the eye, to a mistaken expression, or one absolutely false.

Men have always been struck by the difference which exists between the faculty of the arts and the faculty of colors. How then happens it, that it has not been concluded from this difference, that each of these faculties ought to be founded on a particular and proper organ? It is either because few go back from an effect to its cause, or because, for want of exact knowledge, men are contented with an insufficient explanation, provided it be generally adopted.

"According to Messrs. Gall and Spurzheim," says M. Demangeon, "the organ of painting directs itself to landscapes, when united to that of localities, but to portraits when seconded by that of persons. But to what organ was united the extraordinary talent of Vernet for painting views of the sea and harbours; that of James Van Es, for painting, with so much perfection, fishes, birds, flowers, fruits, and especially shells; that of Peter Breughel, the younger, or the infernal, for painting sorceries, devils, and hells; that of his father and his uncle, who preferred landscapes, fruits, and pleasing subjects; that of those who undertake to paint only caricatures, portraits of women, and other partial and exclusive subjects?"

We have already said, that man is not the result of a single organ, but of the combined action of all; that only the most energetic leads him to act in preference

in the direction of his faculty. Again, this organ is modified by the more or less powerful action of others; thus, when we say, that the talent for painting directs itself rather to landscapes or portraits according as the organ of localities, or that of persons is conjointly developed, we do not exclude the idea, that the painter, who ought essentially to make use also of the talent of imitation, may make use of this faculty on all suitable objects. All the objections of Demangeon do not destroy the principle, that it is necessary to have a sense of colors, in order to seize well their relations and represent them in painting. Besides, these sea views, these sorceries, devils and hells, caricatures and portraits of women, are they not either places or persons? Does not the organ of a caustic spirit contribute to the composition of some of these paintings? Finally, where have we said also, that the painter cannot imitate things? No where.

XVII. *Faculty of perceiving the Relation of Tones, Talent for Music. (Ton-sinn.)*

Why seek in the brain an organ for music? To be apt for music, nothing is requisite but an ear: all the talent of the musician lies in the ear. Thus says the multitude; thus say the physiologists.

In the treatise on the functions of the five senses, I have endeavoured to refute this prejudice, and have assigned its sphere of activity to the ear as well as to the eye. As I cannot suppose, that all persons have read the first volume of my large work, I am here going to repeat, what I have there said against the opinion of those who maintain, that to be a musician, nothing is needed but ear; by this means, we shall here find collected all the proofs in favor of the existence of an organ for music.

There are a great number of animals endowed with a finer ear than man, which, however, do not evince

the slightest aptitude for music. We know birds who do not sing, endowed with as fine an ear as the singing birds. In the species of singing birds, the female, deprived of the faculty of singing, is endowed with the same auditory organs, and as fine an ear as the male.

Certain naturalists do not wish to hear the singing of birds spoken of at all. The notes of birds, say they, have no more analogy to music, than the neighing of horses. It is man alone, endowed with an acoustic ear, who is capable of distinguishing chords and discords. This faculty, they continue, belongs to a peculiar instrument called the cochlea, with which man is furnished, and of which all other animals are destitute.

It is indisputable, that many animals have a finer ear than man, and that the auditory organs in them are more perfect than in our species; this is what I have proved in speaking of the sense of hearing. There I have also shown, that the other mammifera are furnished with a more perfect cochlea than that of man. In my lectures I am accustomed to show my hearers the cochlea of the ox, the dog, the cat, &c.

What shows this error in all its nakedness, is the circumstance, that birds in general, and singing birds in particular, are destitute of the cochlea. It is replaced in them by an osseous canal slightly curved.

If the ear were the material cause of singing in birds, and of music in man, birds and man could not, in regard to singing and music, do more than repeat what they have heard. Now, how has each of the singing birds acquired his note? Where is he who gave lessons to the first thrush, or to the first nightingale? How happens it that birds, hatched and raised by those of a different species, and who have never heard their parents sing, yet utter the note peculiar to their species? M. Darvin says, on the authority of Kircher, "that the young nightingales, hatched by other birds, never sing except in those

cases where they have been instructed by associating with other nightingales." But this is not the fact. If the comparison be permitted, it is with the singing of birds, as with the language of men of the same country. In essential particulars it is the same, but it undergoes modifications within a circuit of some leagues only, in each inconsiderable district, even in a little island. Young birds, raised in the house, do not sing so well the first years, but they improve themselves from year to year, without ever having heard other birds of their own species sing.

How can we conceive the invention of music in man, if the musician must have heard before, all the music which he makes? Who does not perceive, that the composer of music derives these compositions from the interior of his soul? That whatever he expresses on paper by notes, he had previously perceived and conceived within himself? Why then are not persons, endowed with the finest ear, likewise endowed with the most distinguished talent for music?

I am aware that Buffon, Cabanis, and others, charge the musical faults of certain composers to the inequality which exists between the two ears; but daily experience refutes this assertion. It is difficult to find an individual, who has both ears equally good. Holzbauer, the celebrated chapel master at Mannheim, was deaf of one ear, and heard very imperfectly with the other; that did not prevent him from composing very harmonious music. Astley Cooper speaks of a man who was very hard of hearing from his childhood, and who, notwithstanding, was very sensible to harmony; this person played very well on the flute, and performed with great success in concerts. "I have known a child," says Darwin, "who loved music extremely, who easily retained an air after hearing it sung distinctly, and whose organ of hearing was yet so imperfect, that it was necessary to speak very loud in addressing him." I have read in the work of a French physician, the case of a boy who had lost his



hearing in consequence of the small pox, and who, notwithstanding, composed songs himself, and sung them very correctly. All these facts prove, that the ear is, at most, but one of the conditions for executing musical compositions; but that it cannot be considered as the cause of the perception of music and of musical invention.

Those who attribute to the throat, the note, whether of birds or of man, also pass a judgment equally superficial. The throat is for the note only a means of execution, as the hand is for the painter and the sculptor. A counter-tenor or bass voice, the flexibility of the voice, &c. depend, it is true, on the structure of the windpipe. But must not such a faculty, whether in the bird or man, have conceived the whole succession of tones before impressing on the windpipe such or such movements? For the rest, I know perfectly, that the windpipe or the glottis is in connexion with the instinct of propagation and with that of song. The glottis in singing birds is differently formed in the male from its formation in the female. Gelded birds do not sing. The voices of women and of eunuchs differ from that of men. A great number of the species of birds sing only in pairing time. The red-breast, the wren, the canary bird, and the goldfinch, on the contrary, sing through the whole winter. All physiologists know the relation, which exists between the windpipe and the sexual parts, as well in animals as in man.

Willis deduced aptitude for music from the softness of the brain; but he could not sustain this opinion, either by facts or by reasoning. There remains, therefore, no other course to take, but to admit, that there exists in the brain, a peculiar organ for music.

*History of the Discovery of this Organ.*

There was shown me a young girl, named Bianchi, aged about five years, and I was asked to decide what was the most remarkable talent of this child. I discovered nothing in her, which indicated extraordinary memory; and the idea had not yet presented itself to my mind, that the talent for music could be recognised by the form of the head; I did not even know, at this period, the different species of memory. My friends, however, maintained, that the young Bianchi had an extraordinary memory for music, and they inferred from this, that the ideas, which I professed in relation to the external signs of memory, were false. This child repeated all that she had heard sung or executed on the piano; she retained by heart whole concertos, which she had heard at most twice. I inquired whether this young girl learned every thing, without distinction, with the same facility. Her parents assured me, that she was endowed with this astonishing facility, for music only. What could I conclude from this declaration? That there exists a well marked difference between memory for music, and the other species of memory which I knew at that period; and that each species of memory must have its distinct organ.

From that moment I devoted myself to more connected researches into the different species of memory. In very little time I became acquainted with a considerable number of persons, who had an excellent memory for certain objects, and a very feeble memory for others. These observations led me to augment the number of my denominations for memory, and I admitted a peculiar memory of tones.

While occupying myself with these researches, I did not fail to perceive, that the individuals, endowed with an excellent memory of tones, were ordinarily good musicians, and sometimes composers in this art.

This observation led me to conclude, that the denomination, *memory of tones*, was too limited; that it does not express all that constitutes the talent of the musician; that the sphere of this talent extends much beyond the memory; that it comprehends all which regards the relations of tones. I therefore adopted the expression, *faculty of the relations of tones*, an expression which refers the manner, in which the intellect of the musician brings into operation the relations of tones, to the mode of action of the senses in general.

I was fully assured, that the talent for music was not dependent on the aggregate force of the intellectual faculties in general; but that it belongs to an individual, fundamental faculty, and has consequently a particular organ. I had then to reflect on the means of discerning this organ; for, it is only when the seat of an organ is discovered, so as to leave no doubt upon the subject, that I can consider myself secure from all the specious reasonings by which others would combat its existence.

I applied myself to observing the heads of musicians. Chance so ordered, that I met with several, in whom the superior lateral part of the forehead was very narrow, and the temporal part, on the contrary, very broad; whence it resulted, that their foreheads formed a segment of a truncated cone. At this period, I was not far enough advanced in my observations, to seek the external mark of each particular faculty in a determinate region of the head. I therefore thought, for some time, that a forehead, in the form of a segment of a truncated cone, was the external sign of musical talent.

But soon I had an opportunity to see great musicians, Beethoven, Mozart, the son, Kreibitz, &c., who had the superior part of the forehead large and prominent; which made me renounce my idea, that a forehead formed like the segment of a truncated cone, was the characteristic sign of a talent for music. It was not difficult for me, at Vienna, to observe a great number

of musicians, among whom were some of the highest merit. I moulded the heads of several of them, in order to be able to make these comparisons more easily. I finally succeeded in discovering a region, in which all musicians, endowed with inventive genius, have a prominent projection, produced by the subjacent cerebral mass.

The better to establish my discovery, I endeavoured to ascertain the counter proof. I observed children and adults who manifested no taste for music, some of whom, in fact, gave evidence of antipathy to it. In all these individuals, I found the same region of the brain absolutely flat. Finally, I procured for myself the skulls of some great musicians, and their examination at length convinced me, that my discovery, relative to the faculty of the relation of tones, was absolutely exact. After this, nothing prevented my professing this truth publicly. I am going to lay open to my readers the natural history of the faculty of the relation of tones, both in animals and in man; after which I shall explain in detail, the proofs of the existence of this fundamental faculty and its organ.

### *Natural History of the Faculty of the Relation of Tones in Man.*

The innate forces of man have manifested themselves at all times. Song has also been in all ages, one of the favorite amusements of the human race. Music and song are not the inventions of man; the Creator has revealed them to him by the aid of a peculiar organization. By means of his organization, man is placed in relation with the laws of the vibrations of bodies, as the painter is with the laws of colors. There exist without us certain laws, according to which sonorous vibrations are produced and propagated. The experiments of Chladni have rendered sensible to the eyes some of the laws of these vibrations,



If we cover with fine sand a plate of glass or metal, hold it by one of its points, and make it tremble by means of a blow from a fiddle-bow applied to one or another of these points, we can decide beforehand, that the sand, arranging itself in a manner foreseen, will form this or that determinate figure. The vibration of the molecules of the disk gives rise to this or that regular figure, according as the point to which the bow is applied, and that which is sustained, vary. The reader will be able to see the farther experiments, by aid of which this philosopher demonstrates the laws of the vibrations of bodies, by referring to the treatise on acoustics which he has published. It is on these laws of vibration, that tones are founded, which are subordinate and coördinate among themselves, according to fixed laws. On the supposition that man must necessarily be sensible to music, it would follow, that he must be endowed with an organization, that places him in relation with all the laws of music, that he should possess an organ on which these laws are impressed, and which should, to a certain extent, represent their type. Wherever the organ is wanting, there exists no relation between the animal and the tones. Where the organ exists, the animal or the man is agreeably affected by harmony, and disagreeably, by the discordance of tones. When this organ has acquired a certain perfection, the animal or the man not only perceives and judges well the relations of the tones, but also creates within himself relations and successions of tones, which please the more, as they are more conformable to the external laws of vibrations, and to the organization of other individuals.

The following observations will convince the reader, that the faculty of tones is a proper and independent faculty, and, consequently, supposes a particular organ.

There are frequent examples of this faculty having existed, in a high degree of activity and perfection, from the tenderest age. Handel had hardly begun

to speak, when he attempted to compose music. His father banished all the instruments from the house, yet he soon found means to exercise himself. At the age of ten years he commenced a series of sonatas in three parts. Piccini, from his tenderest infancy, showed such a decided taste for music, that he could not see a harpsichord without starting. Mozart, sen. travelled through Europe at the age of six years, playing on the piano, not only with great power of execution, but with soul and taste. Mozart, jr. studied composition at the age of twelve years, under the famous Streicher. Another prodigy is the famous Desales, a child of twelve or thirteen, who played a concerto on the violin, beset with difficulties, with a vigor and address altogether extraordinary. This child felt strongly what he executed; his style was grand and full of energy. Mademoiselle Bills, of Bruchsal, then seven years old, began taking lessons in music from her father, towards the end of Dec. 1799, and, from the month of April, 1800, began to give concerts at Paris. Crotch, from the age of two years, discovered an extraordinary talent for music. Crouchby played on the harpsichord at the age of three years, and gave evidence of disapprobation at each false touch; at the age of six years he was a virtuoso. Every body knows the brothers Pixis, of Manheim, and many other similar precocious geniuses.

Mademoiselle Leontine Fay, and the child who plays Richard III. at London, have found a rival in the young Hungarian, Baron de Praun. This young man is hardly ten years old, and he has already astonished the Romans, among whom he passed some months, not only as a virtuoso by his success on the violin, but also by his astonishing erudition. In a brilliant *soirée*, where was found united all that Rome contains of distinguished *savans* and artists, the young de Praun, after having executed the most difficult concertos of Rhode, with a taste and precision which astonished Paganini himself, sustained a scientific

examination, and resolved more than a hundred questions, which were addressed to him by the professors of the archi-gymnasium. His Holiness, wishing to honor the precocious talent of this new Pic de la Mirandola, has just named him knight of the golden spur, and count of the sacred apostolic palace. The archi-gymnasium has likewise decreed to him a gold medal.

Such prodigies are, ordinarily, in every other relation except in that of their peculiar talent, children like others; which proves, that the faculty by which they distinguish themselves, as well as its organ, are independent of all the other faculties and all the other organs, and that we must recognise it as a peculiar power.

Individuals, endowed with a great development of the organ of the faculty of the relation of tones, born, consequently, for music or for song, often excel, without any previous instruction, in any kind of music which they are able to execute. Such a peasant is a virtuoso by his manner of whistling; a leaf from the linden tree, a straw, are the instruments on which he surpasses his comrades; a milkmaid leads the singing at church; a beggar charms beneficent souls by his ballad.

### *Activity of the Organ of Music in Idiocy and in Mental Alienation.*

In certain cases both of mania and of idiocy, where all the other qualities and faculties of the soul are deranged, this manifests itself almost in a state of integrity. A girl of fourteen years sang with precision forty songs, all which she knew by heart; she was, however, in such a state of idiocy, that she ate plaster and charcoal, gnawed bones like a dog, and made efforts to devour whatever fell into her hands. A lady, who usually never sang, became insane in consequence of lying-in; during her insanity, she sang

without interruption for several weeks, and sometimes her singing was singularly melodious. Spurzheim relates a similar fact, observed in England. Would it be right to conclude, that there exists a relation between the womb and the organ of music? I have already spoken elsewhere of a young boy, who remained two months deprived of the consciousness of his own existence, and who, during this period, sang all the ballads which he had before learned. Pinel speaks of a mad musician, in whom, from the time of his convalescence, a confused recollection recalled his favorite instrument the violin. It was given him, and he regained in a few days his previous superiority. It is to be remarked, that this musician still held at the same time the most rambling discourses, often spoke only by monosyllables, which he mixed with leaps, dances, and gestures the most senseless and the most absurd. I have seen a madman who gave lessons on the violin. It is too well known, in the insane hospitals, that certain maniacs trouble the repose of all the neighbourhood by their perpetual singing. Cabanis remarks, that he has known certain persons, who, always singing false in a state of health, sang justly by accident in the paroxysms of fever or in certain extatic desires.

### *External Appearance of the Organ of Music in Man.*

In order to make observations on this organ, it is necessary to avoid confounding with real musicians those persons, who from habit have a great facility for playing on an instrument. Frequently they pretend to tell me, that I ought to find in certain persons, especially certain ladies, an organ of music greatly developed; and I find nothing but the habit of execution. Such performers betray themselves by the character of their playing, which is rather the work of the fingers than of their minds. Their countenance



expresses nothing of that abandonment, of that sweet delight, which penetrates the whole soul of the true musician.

Thus far I have seen the organ of the faculty of the relations of tones greatly developed in all the musicians, who are composers in their art ; it assumes two particular forms. Either the external angle of the forehead, placed immediately above the external angle of the eye, enlarges itself considerably toward the temples, in such manner, that in this case the lateral parts of the forehead overlap the external angle of the eye, in which case all the frontal region above the external angle of the eye, as far as the half of the height of the forehead, is considerably prominent ; or there rises immediately above the external angle of the eye, a prominence in the form of a pyramid, the base of which is supported above the eye, and the point extends to the external anterior edge of the forehead, as far as the half of its height. Hence it happens, that musicians have the lower part of the forehead either very broad, or square. The celebrated drawer of animals, Tischbein, at Hamburg, without thinking of the existence of an organ of music, had made the same remark on the heads of great musicians. They have ox fronts, he tells us. Frequently the foreheads of musicians appear much swollen above the external angle of the eye.

Mozart, father and son, Michael Haydn, Paër, MM. the brothers Naderman, Dussek, Pl. LXXXVI. fig. 1 ; Marchesi, fig. 2 ; Viotti, fig. 3 ; Blasius, Daleyrac, Delavigne, Zumsteeg, Crescentini, are examples of the first conformation. Beethoven, Lafont, Neukem, Joseph Haydn, J. J. Rosseau, Benucci, fig. 4 ; Grétry, fig. 5 ; and Gluck, fig. 6, of the second.

I have, as yet, no idea of the difference of talent which results from this difference of conformation. It is, however, to be presumed, that a musician, who should be at the same time instructed in organology, would discover a difference in the talent of music ; it

is certain, that one or the other of these two conformations is constantly met with, in all persons endowed with great musical genius.

I know personally a great number of musicians celebrated either for song or for composition. I have carefully examined the ladies Mara, Sessi, Canabich, Schmalz, Gail, Bigot, Catalani, Barilli, Bertinotti, Voitus, Bills, Albert, Pasta, Fodor, &c., &c., MM. Krebs, Himmel, Reichard, Gløgle, Gara, Dulong, Boyeldieu, Galli, Rossini, Lays, &c. In all of them, the development of the cerebral part indicated, is so full, that, if we could arrange all their busts in one line, the most indifferent observers could not fail to convince themselves, that this is the constant and characteristic mark of musical genius.

Neither have I ever met an exception in the portraits or busts of great composers of music, of whom there remains to us nothing but the works. Examine the busts of Haydn, Gluck, Mozart, Grétry, Lulli, Sacchini, Rameau, Philidor, &c.

At Vienna, an ecclesiastic came to see me, and without being willing to give his name, begged me to instruct him in organology. After I had explained to him its general principles, he ased to see some organs. I showed him several, as well in sculls as in casts. On coming to the organ of locality, I told him, that he was endowed with it to a high degree, and that he must be very fond of travelling: he told me, with joy, that he actually was so. When I affirmed, that he had also the organ of the faculty of numbers and of mathematics greatly developed, he threw himself from his chair, and told me that he was professor of mathematics. "Yet," I continued, "you would have distinguished yourself still more in music, especially in the theory." He then sprang on my neck, and told me that he was the abbé Vogler. He has himself related this anecdote in all societies, which has made him a zealous proselyte to organology.

A lady had become insane in consequence of a blow

received on the occiput ; her relatives requested me to observe two large prominences which had grown out, they said, since her disease, on the lateral parts of the forehead. These prominences were only the organs of the faculty of music, become more apparent because she had lost her flesh. I learned afterward, that they deplored the misfortune which had happened to this lady, especially on account of her great talent for music. In treating of the faculty of localities, I have related a similar example.

The organ of the faculty of music is formed by the convolutions xx. Pl. viii. x. plaited in zigzag, the folds of which regularly diminish ; they form a pyramid or cone, the base of which is placed immediately above the external angle of the orbital plate, and rises to an inch or an inch and a half. When these convolutions are much developed, especially in their inferior part, it follows, that the brain and the cranium become larger in the region which they occupy ; the external part of the superior orbital wall is completely filled by the cerebral mass : there is then, in the cranium, only a small part of the external orbital wall which is found placed without the brain, a circumstance which enables us very easily to distinguish the organ of the faculty of tones on the cranium. Pl. lxxv. represents the cranium of Kreibitz, a celebrated violinist, who played habitually with the Emperor Joseph II., in whom likewise the organ of music was very well developed. What a difference between this head and that of Pl. lxxvi !

This explains why the negroes, the inhabitants of Otaheite, the Spaniards, the French, and the English, furnish a much smaller number of great musicians, than the Italians, Bohemians, and Germans. The heads of these last are generally broader in the region referred to than those of other nations. See the narrow head of a negro of the Cape of Good Hope, Pl. xc. Must we again attribute these differences to the influence of climate ?

I know, however, some negroes, who from their infancy have had a passionate fondness for music, and who evince a great musical talent. All these negroes have the inferior exterior part of the forehead, placed above the eyes, very large. Pl. xci. represents the head of a Congo negro, who learned music of himself, and executed it on almost all the known instruments. No one will deny that the Russians, Spaniards, French, and English have great musicians; and, on the other hand, there are among the Germans and Italians individuals, in whom the organ of music is developed to so feeble a degree, that, far from finding pleasure in music, they have even an antipathy to this art. Lessing and Tischdein are remarkable examples of this.

The organ of music, as happens likewise with all the other organs, is modified in a different manner in each individual, though essentially it is the same organ in all. The different individuals of the same species of birds have each a note differing a little from that of the other. Thus the music of Mozart, of Leo, of Jomelli, of Pergolesi, of Durante, Martini, Cimarosa, has a different character from that of Gluck, Haydn, Cherubini, Boyeldieu, Spontini, Mehul, Nicolai; and all vary among themselves. Baillot, Boucher, Rode, and Lafont, though all four excellent violinists, offer, however, great modifications.

The character of the composition of each musician is determined by the greater or less development of other organs, which accompany that of music. When the considerable development of the organ of music coexists with a great development of the organ of murder, it produces a predilection for warlike music; when coexisting with a development of the organ of theosophy, it produces a predilection for church music, &c. Musicians by applying these principles, will be able to account to themselves for their individual taste, and for the proper character of their compositions.

It appears to me, that men who are capable of de-



ducing the laws of composition from the laws of sonorous vibrations, and from the relations of tones, and of thus establishing the most general principles of music, ought at the same time to be endowed with an organ of numbers very much developed; for, the exercise of this degree of musical talent requires, without question, much calculation; moreover, the inferior convolution of the musical organ, the largest of all, is immediately continuous with the organ of numbers. This explains why one may be an excellent musician, and not have the talent of composition, or be a great composer, without being at the same a great musician.

We have seen, that this organ does not always follow the usual course in its development. It acquires, commonly, a precocious development in subjects endowed with very great musical talents; and I saw it so developed in a little girl aged two years, that it was not difficult to me to predict the astonishing progress which this child has since made in music; but I also know a case, where it began to develope itself only at the age of seventeen.

I here quote a passage extracted from *Memoirs, or Essays on Music*, by Grétry, published in the year V. In this passage, Grétry speaks of his innate taste of the instinct which drew him towards music. Perhaps it might be inferred, that a wound contributed to the development of his musical organ.

“If during these miserable years I did not wholly waste my time, if I made any progress in music, if I gained any trifling knowledge, I did not obtain this advantage from the lessons of the instructor, but in spite of them; for, if any thing had been capable of destroying in me that innate taste, that instinct which carried me towards music, I dare affirm it was the manner adopted to teach it me.

“*I must here speak of an accident which I think has influenced my organs in regard to music. I may be in an error, but it is certain, that no man would dare affirm the contrary.*

“In my country it is the custom to say to children, that God never refuses them what they ask the day of their first communion. I had long since resolved to ask him, that he would cause me to die on the day of this august ceremony, if I was not destined to be an honorable man and distinguished in my profession. That very day I was threatened with death.

“Having gone after dinner, on the towers to see the wooden clocks strike, of which I had no idea, there fell on my head a rafter, weighing three or four hundred pounds, and I fell down insensible.

“The church warden ran to the church to seek the *extreme unction*. I came to myself during this time, and with difficulty recognised the place where I was; they showed me the weight I had received on my head. Come, said I, putting my hand on it, since I am not dead, I shall be an honest man and a good musician. They supposed these words to be the effect of my confusion. I appeared not to have any dangerous wound; but on reviving, I found my mouth full of blood. The next day I observed, that the skull was beaten in and the cavity still exists.

“I had perhaps arrived at the period when the character changes; but it is certain, that I became all at once an habitual dreamer; my gaiety degenerated into melancholy; music became a balm which consoled my sadness; my ideas were more clear; and my vivacity returned only at intervals.”

Several times, persons who had applied themselves to music with unusual ardor, and long in succession, complained to me, that they experienced pains and spasms in the external inferior part of the forehead. The reader will easily explain to himself, why a long continued application to music provokes pains and spasms rather in the region referred to, than in any other. A lady spoke to her singing master of the organ of music. She could not designate the place to him, when the master said to her; “If there is an organ of music it is there, placing his fingers; it is

there when I compose, that I experience a painful sensation; when an idea does not come to me, it is there that I carry my hand."

I asked Mr. Berton what he felt, after having composed a long time with great application? He answered me, that he felt a great void in his head, and while saying this with a certain air of embarrassment, he carried both his hands to the two organs of music.

All, I have hitherto said on the faculty of music and its organ, leaves no doubt, that the faculty of music is a fundamental quality, and that this faculty is founded on a particular organ.

*Natural History of the Faculty of Music, and of its Organ, in Animals.*

There is not a single mammiferous animal endowed with the sense of music, to the extent of being able to sing itself, or even of repeating the notes which it hears. Thus the skulls of this class of animals are smaller than that of man, in the region where the organ of music has its seat. Their orbits are placed either half or wholly outside the brain. Either there exists no orbital plate, or there is only the internal part situated toward the cribriform bone or the nose. It follows, that the mammifera are destitute of a great portion of cerebral matter, which in man is found in this region, and which consequently must be destined to functions peculiar to the human race.

I will not, however, maintain, that certain mammifera are not endowed at least with the sentiment of the harmony of tones; the elephant, and sometimes dogs appear to hear music with interest. Camels, asses, mules, and even oxen, better support the fatigue of their accustomed work, when they are allowed to hear the sound of music or of singing; every body has seen dogs, bears, and Franconi's horses dance in time; but what is mentioned, in this respect,

of spiders and serpents, seems to me to belong rather to an agreeable impression which the vibrations of the air excited in them, than to a sentiment of harmony or of melody.

The greater part of birds have nothing which can be called singing. Some of them are endowed with the faculty of imitating a song, or a melody : of this number are the bullfinch and the tufted lark. In a few species, singing is common to both sexes ; but the note of the female is always weaker, and less perfect. Almost always it is the male only that sings. Some have only their proper, well characterized note, as the *pinçon*, the goldfinch, the greenfinch, the nightingale, &c. Others, beside their proper note, have the faculty of imitating the note or the cry of the birds in their neighbourhood ; as the different magpies, the *écorceur*, the mocking bird, the mocking thrush (*turdus polyglottus*) ; others finally imitate the voice of man and other animals, and can be taught by various wind instruments.

How can we account for these differences ? Whenever any animal has a quality or a faculty in common with man, he must also have the corresponding organ in the brain. Compare the brain and the cranium of singing birds, with that of birds which do not sing. In these last, the brain is less broad near the eyes ; the cranium is contracted immediately above the eyes, or, the anterior superior part of the orbits ; the orbits themselves are very large and oval ; and in many species the brain does not advance to the eyes. Pl. LVII. fig. 1, 2, 3, 4, 5. LXXI. fig. 1, 2, 3, 4, 5, 6, 9, 10.

In the singing birds, on the contrary, the brain, and consequently the cranium, are broader toward the exterior anterior edge ; hence it happens, that the orbits are rounder : for, the lateral depression, which exists in those who want the organ of music, is diminished by the development of this organ. Pl. LXXI. fig. 7, 8, 11.

To form a clear idea of this difference, let any one



place before him the crania of the grossbeak, by the side of that of the yellow canary, or of the goldfinch; that of the cuckoo, the rollicker, by the side of that of the blackbird, the common thrush, or the starling.

After this, compare together the singing birds, either species with species, or individual with individual, always having regard to the greater or less perfection of their note. The cranium of the *pinçon* of the goldfinch, and of the redbreast, is not as broad in the region alluded to, as that of the nightingale and the mocking bird; that of the blackbird is less so than that of the thrush properly so called, (*turdus musicus*.)

To convince myself of the truth of what I have just advanced in relation to individuals of the same species, I have reared, for example, dozens of mocking birds; and, while they were still blind, I have placed near them thirty chosen singing birds, of different species. Some of my mocking birds learned to imitate the note of one only of their numerous masters; others imitated several; and some imitated them all with astonishing perfection. Both during their life, and after their death, a practised eye could distinguish by the inspection of their heads, the greater or less development of this cerebral part. The greater part of my auditors, after having a little practice, had acquired a facility for discovering these differences.

In those species in which the male alone sings, the male ordinarily distinguishes himself from the female in a manner equally striking. Place the cranium of a male nightingale by the side of that of a female, and you will always find the orbits of the female more hollowed, those of the male on the contrary more rounded; and consequently his head larger in the superior part, in the diameter from one exterior edge of the orbit to the other. Among the singing birds, the bird catchers recognise the male by this sign, that is, by this great breadth of the head above the eyes,

and thus distinguish him from the female which has the head narrower above the eyes. Still more, even among the males, those, which have the head broadest in the region referred to, have the most perfect note. In the choice of birds, I have always had reference to this sign, and it has never deceived me. This difference is sensible even in the yellow canaries; though the females learn by imitation, to repeat little pieces which they sing, yet always less perfectly than the males, and they usually forget them during the moulting season. I well know, that such observations require much experience, and great patience, and great perseverance. The adversaries of organology find it much easier to cut short the question, than to constrain themselves to make numerous observations, the result of which would expose them to the danger of being convinced of the truth of my doctrine, by the force of facts.

Certain persons, with the best intentions, can discover none of these delicate differences. Let such persons remember, that, in researches of every kind, it is necessary, in the first place, to learn by long practice to place a sure reliance on the senses. It is necessary to understand music, and to look at paintings. There are individuals who never learn to exercise their fingers in touching, or their eyes in seeing. Since Doctor Garden, in an article of the *Journal on the physiognomical system* of Spurzheim, has advanced, that even in the human cranium, there does not exist one of all those prominences, which we attribute to a considerable development of the brain, I should be wrong to complain of those, who cannot distinguish differences so minute in the heads of birds!

I can warrant to those who are willing to observe, and who are capable of making observations, that they will find all those which I relate, confirmed, and that the examination of the heads of birds, will equally convince them of the existence of an organ of music.

"The comparison," says Demangeon, "of lovers of music, and of musicians without tact or rhythm, as well as the difference of talents for symphony, harmony, and melody, also lead us to believe, that music cannot belong to a single faculty. Can it be believed, according to Mr. Gall, that the organs of music and of the generative energy are so distant from each other, and without any cord of communication between them, when we consider, that several animals sing only during their pairing; that the changing of the voice follows the progress of puberty," &c.

Has Demangeon already forgotten, that the generative energy has also its organ in the brain, and, consequently, the organ of music and that of the propagative instinct are not so distant from each other? Moreover, it is also in my work, that he has gained the knowledge of the relation, which exists between the development of the instinct of singing, of the genital parts, of the glottis, &c.

### XVIII. *Faculty of the Relation of Numbers.\**

There is no faculty which men think themselves better entitled to deduce from the intellectual forces taken collectively, than the disposition for arithmetic and for the mathematics generally. It is supposed,

---

\* I know perfectly well, that the vulgar arithmetic, which itself is only a small part of the science of calculation, does not constitute all the mathematics, and that the synthetic method, which the ancient geometers employed exclusively, has nothing in common with calculation. I am not ignorant, that distinguished mathematicians have sometimes very little of the habit of numerical calculation. But, as I find the same cerebral part very much developed, as well in all persons who have a great natural facility for calculation, as in those men who have enriched mathematical science with the most sublime discoveries, I think myself authorized to admit, that it is the same organ which gives to the young Colburn the facility of calculation in his head, to Pythagoras that of proving, that the square of the hypotenuse equals that of the two other sides of the rectangular triangle, and which enabled Laplace to write his *mécanique celeste*.

that the study most capable of exercising the judgment is that of mathematics. Nothing in this science, it is said, comes from without, every thing here is the work of the human understanding, every thing here is a real creation of attention and of the faculty of deriving consequences. There cannot therefore exist any peculiar organ for the faculty, by virtue of which a man has a great facility for arithmetic and for mathematics in general.

What I am going to say will show how far these pretensions are true or false.

### *History of the Discovery.*

At Vienna, they mentioned to me a scholar of St. Pœlten, who was known throughout all the country, by his talent for calculation. He was the son of a blacksmith, and had received no more instruction at school than his companions; for every other purpose, he possessed about the same talent with them. I induced him to come to Vienna, and presented him to my audience: at this period he was nine years of age. When they gave him three numbers, each expressed by ten or twelve figures, asking him to add them, then to subtract them two by two, to multiply and then divide them by numbers containing three figures; he gave one look at the numbers, then raised his nose and eyes in the air, and announced the result of his mental calculation, before my auditors had time to make the same calculation with their pens in their hands. He had created his method himself.

This boy astonished the inhabitants of Venice. An advocate came to testify to me his vexation, that his son, aged five years, was occupied exclusively with numbers and calculations, and that it was impossible to fix his attention on any thing else, even the sports appropriate to his age. I compared this child with the first; I could find no other resemblance be-



tween their heads, than a remarkable prominence at the external angles of the eyes, and immediately at the side. In one as well as the other, the eye was in a degree covered by the superior lid at its external angle.

These two examples of distinguished talents for arithmetic, and the coincidence of a similar conformation of the same region of the head, suggested to me the idea, that the talent for calculation might well be a fundamental faculty, depending on a particular organ ; for, at this period, I had already made great advances in my theory of the plurality of organs.

I then sought out men distinguished by their talent for calculation. I first remembered counsellor Mantelli, whose favorite occupation was to invent and resolve problems of mathematics, and of arithmetic in particular. I found the same conformation of the head, in the region of the external angle of the eye. I went to see the Baron de Vega, author of the *Tables of Logarithms*, and then professor of mathematics, who in every thing, not immediately concerning this science, was a very ordinary man. I found again the same form of head in both. I examined families and schools, and had shown to me those children who distinguished themselves from their fellows by the talent for calculation. As I found the same external character in all, what could then prevent me from considering the faculty of numbers, as a peculiar faculty, and admitting a peculiar organ for this faculty.

### *Natural History of the Faculty of Numbers.*

Man creates nothing. His intelligence is limited to the recognition of what exists. If one plus one necessarily equals two, and twice two equals four, it is not the talent of man which creates this necessity, but his talent acknowledges this necessity

as the result of eternal and immutable laws. The opposite angles of a parallelogram are eternally equal, whether this truth be discovered by a philosopher or not; and it is the same with all mathematical truths. If mathematicians justly take possession of optics, astronomy, music, &c., inasmuch as these sciences require the application of numbers, I ask, if the laws of the refraction of luminous rays, the laws of the vibrations of air and of sonorous bodies, the laws of motion in general, if these materials, which the mathematician puts in operation, have in the external world a real existence, independent of the mind, which conceives and combines them, or, if it is the genius of the mathematician, that creates them? If they have an existence, independent of the genius which submits them to calculation, which my readers will admit without difficulty, it follows, that there exists an external world for the talent of the mathematician, as for all other talents, and that his merit is limited to conceiving this external world.

Now, man must have received an organ for these objects, an organ by the aid of which he finds himself placed in relation with them; by the aid of which a particular series of laws is revealed to him. Without such an organ, it is impossible, that he should be instructed in the existence of these laws. When this organ has acquired a high degree of development and activity, these secrets are found in some manner unveiled before it. Man divines the external world, and the operations of this organ are in harmony with the true proportions of quantities, with the laws of refraction, of vibration, and of motion in general.

If it were otherwise, how could this talent be sometimes found to such astonishing perfection, in children and in men, absolutely of gross intellect? Independently of the two cases which I have related, the journals have spoken in a tone of admiration of a boy of seven years, named Devaux. He had a passion for going to all the fairs, and waiting for the traders,

at the moment when they had closed their accounts ; and when they had been mistaken in their calculations, it was his greatest pleasure to discover the error.

The young Bidden, of Devonshire, aged only twelve years, had the honor of exercising in presence of His Royal Highness, the Duke of York, his astonishing faculty for the combinations of numbers. His Royal Highness and the persons present at this exercise expressed the greatest surprise, when they saw this child, without the aid of any figure, resolve all the problems proposed to him. He surpassed all that had been seen extraordinary in this department ; and all kinds of calculation were equally familiar to him. He was the son of a poor laborer of Exeter, the father of nine children.

I saw in Paris the young American, Colburn, of whom mention has been made in the papers of the United States, and subsequently in the English and French Journals. I have moulded the head of this child, and had his portrait drawn. (Pl. LXXXVII. fig. 1.) I give a short notice in regard to him, which follows :

“This child was born in April, 1804, at Cabot, county of Caledonia, state of Vermont. He was not yet seven years old, when he was seen by Mr. Mc. Neven, who gives an account of this visit in the *Medical and Philosophical Journal and Review*, printed at New-York, 1811. In the ordinary course of life, Zerah appears in every thing like other children, by his frivolity and the puerile character of his amusements ; but when his attention is entirely fixed on any subject, he then displays faculties very superior to his age, and when numbers are in question, superior, I think, to what could be expected from any age whatever. It was in August last, (1810,) that his father, hearing him repeat between his teeth some numbers, which he multiplied for his amusement, perceived his prodigious faculty for calculation. The attention which it excited, and the exercise given to

it in consequence of this attention, have, in a few months, singularly increased it. The promptitude of his answers on the questions of arithmetic proposed to him, is such, that he seems to answer from memory.

It cannot be doubted, however, that this promptitude is due to the rapidity of his combinations, for in calculations at all complicated, he is often heard to multiply, add, or subtract, aloud, and with incredible rapidity. He catches himself sometimes when he commits any error, and appears excessively mortified in consequence; but this scarcely ever happens to him. Mr. McNeven has heard him answer without the slightest appearance of hesitation, and without the least error, to the following questions: *Question.* What is the sum of 1347, 1953, and 2091. *Answer.* 5391. *Question.* What are the numbers, which, multiplied together, give 1242? The following solutions were given as rapidly as the words could be uttered; 54 by 23, 9 by 138, 27 by 46, 3 by 414, 6 by 207, 2 by 621. *Q.* What is the number, which, multiplied by itself, produces 1369? *A.* 37. *Q.* What is the number, which, multiplied by itself, produces 2401? *A.* 49; and 7 multiplied by 343 produces the same number. When the numbers were expressed by thousands and hundreds, he exclaimed with impatience, "Put them in hundreds;" that is, for 2401, he wished them to say twenty-four hundred and one. *Q.* What will 6 give, multiplied by itself 6 times? He calculated aloud in the following manner, as rapidly as he could speak; 6 times 6 make 36, 6 times 36 make 216, 6 times 216 make 1296, 6 times 1296 make 7776, 6 times 7776 make 46656, 6 times 46656 make 279936.

*Q.* how many hours in 26 years 11 months and 3 days? *A.* 226992. The person, who had addressed this question, was mistaken in the calculation he had made on his side; so that when Zerah answered, he thought it was he who had deceived himself. Zerah after a moment's reflection assured him, that it was



his own calculation which was right. The operation was repeated and the justice of his claim was allowed. Those, who questioned the child, had forgotten to bring into the account the difference of the leap years, and reckoned the last eleven months at thirty days. This forgetfulness reminds me of an anecdote of the same kind. They brought to D'Alembert a little shepherd, who had also an astonishing facility for calculation. "My child," said D'Alembert to him, "there is my age; how many minutes have I lived?" The child retired into a corner of the room, hid his face in his hands, and came a moment afterward to announce the result to D'Alembert, who had not yet finished his own calculation. Having completed this, he finds that the two results do not agree. The child returns into his corner, repeats his calculation, and returns, assuring him, that he was not mistaken. D'Alembert verified his own. "But, Sir," suddenly answers the child, "have you thought of the bissextile years?" D'Alembert had forgotten them, and the little shepherd was right.

"As they proposed to him to multiply 123 by 237 his father objected that two triple numbers were too difficult. The child answered that he could multiply them, and kept his word; he even multiplied very promptly 1234 by 1234. Still it was seen, that difficult questions fatigued him, and he often begged, that they would not give him such complicated ones. While he answers, it is seen, by his appearance, the state of his eyes, and the contraction of his features, how much his mind labors.

"His physiognomy is very expressive; his forehead is small, but angular; the orbital arcs (the eyebrows) considerably advanced; his eyes are grey, lively, and always in motion; his skull is arched and considerably broad; he has a small occiput, and red hair; he is singularly strong and large for his age; his motions are rapid, and he is always in action.

"He has never been at school, and neither knows

how to read nor write. He was asked how he made his calculations. He answered, that he saw them clearly before him. He has yet no idea of fractions, and can reckon only in round numbers. He is the fifth of seven children, of whom no one is distinguished by remarkable faculties. His father, Abiah Colburn, was born with six fingers on each hand, and Zerah is the only one of the children, who inherits this singularity.

“Mr. McNeven, in speaking of Zerah Colburn, recalled another personage, Jedediah Buxton, known in the last century by an extraordinary talent for calculation, but unaccompanied with any sort of mind. Jedediah even seemed destitute of some of the most common feelings. Music offered to him only a confusion of sounds; and when carried to a play of Shakespeare, played by Garrick, he occupied himself merely in counting the number of words uttered by this great actor. Zerah Colburn, on the contrary, manifests much intellect; he is prompt at repartee, and sometimes sarcastic. Some days before the visit of Mr. McNeven, a woman had amused herself by asking him how much are three zeros multiplied by three zeros? ‘Precisely what you are,’ he answered; ‘nothing at all.’

“It seems to us greatly to be feared,” says Mr. McNeven, “that the efforts of attention, to which Zerah Colburn gives himself, may fatigue or disorganize this young head, and intercept whatever might be hoped from it, if left to the natural course of his ideas and developments.” It is also possible, that these developments may be arrested by a new freak of nature which has produced them, or even that these extraordinary faculties may exhaust and destroy themselves.\* McNeven quotes the example of Mr. Van R.

---

\* See A Memoir of Zerah Colburn; written by himself: containing an account of the first discovery of his remarkable powers; his travels in America and residence in Europe; a history of the various plans devised for his patronage; his return to this country, and the causes which led him to his present profession (theology;) with his

of the village of Utica, also living in the United States, who, at the age of six years, distinguished himself by a singular facility for calculating in his head; at eight years, he entirely lost this faculty without knowing how. At this moment Mr. Van R. calculates like other people, with his pen in his hand, neither better nor faster than any other person, and does not retain the slightest idea of the manner in which he performed his calculations in childhood."

The young boy of St. Polten also told me, that he saw the numbers on which he operated, as if they were written on a slate. This is the place to speak of the talent of the daughter of Lord Mansfield, whom Spurzheim saw at London, when she was thirteen years old. This young lady almost equals Zerah Colburn; she extracts, with great facility, the square and cube root of numbers of nine places.

Who is there, that will seek in these children their great facility for calculation in the faculties taken collectively, in a general faculty of drawing conclusions? All these difficulties disappear the moment we admit a peculiar organ for the talent, by which these individuals are distinguished. In this hypothesis, we conceive, that the organ of numbers may, in certain cases, receive a premature development and extraordinary activity, just as those of the instinct of propagation, of music, &c.

Besides, it is by no means rare, to find the talent for calculation in persons, whose minds have not been developed. A shepherd of the Tyrol, Peter Annich, had made himself famous by his astronomical calcula-

---

peculiar method of calculation." Published, 1833. Colburn gives the following account of his introduction to Dr. Gall, (Mem. p. 76.) "Dr. Gall, well known as the author of the system of craniology, was then in Paris, and by means of his tutor, Zerah was introduced to him, without the doctor's having any previous intimation of the character of his visitor. Being requested by Mr. C. he proceeded to examine the cranium of his subject, and readily discovered on the sides of the eyebrows certain protuberances and peculiarities, which indicated the presence of a faculty of computation." [Ed.]

tions. His reputation induced father Hell to go to seek him ; when this philosopher questioned the shepherd on his preliminary acquisitions, he learned, with astonishment, that the latter did not even know the name of mathematics or of astronomy. It is twelve or fourteen years since a negro caused a great sensation in London by the astonishing calculations which he made.

Schubler, counsellor of regency at Stuttgard, introduced us to Martini Hæfele, vinedresser of Alfaltrach, three leagues from Heilbrun. This man, who, of his own accord, applied himself to mathematics, and especially to the higher departments of algebra, made astonishing progress in several branches of the practical mathematics. Afterward, there were given him the works of Kaestner and Karsten, which he devoured ; for ten years he had been making researches tending to improve the differential and integral calculus. So much for the evidence, that the talent for mathematics is innate, and has no necessary connexion with the other intellectual faculties.

It may even be maintained, that this faculty can, like other dispositions, be transmitted from father to son during several generations. The family of Bernouilli furnishes an example.

Mathematicians, so born, like all men endowed with very distinguished talents, manifest this faculty very early, and are led on by an irresistible inclination to cultivate it.

Mathematics had always a peculiar charm for Pascal. Thwarted in his passion for geometry, he became only more ardent to devote himself to it. On the simple definition of this science, he succeeded in discovering, by his penetrating genius, as far as the thirty-second proposition of Euclid. At the age of sixteen years he published a treatise on conic sections. From geometry he passed, with the same facility, to the other parts of mathematics. He was hardly nineteen when he invented the *Roulette*, a singular arith-



metical machine, by which may be made all sorts of arithmetical computations, without pen, and without counters, and even without knowing arithmetic.

Galileo had, from his infancy, so strong a passion for mathematics, that he may be said to have been born a mathematician. Joseph Sauveur and Ozanam learned geometry without masters. Lalande, when hardly nineteen, was appointed commissioner of the academy to go to Berlin, to determine the moon's parallax, in concert with La Caille, who went to perform the same operation at the Cape of Good Hope. Tycho Brahe had, from his infancy, an extraordinary inclination for the mathematics. Euler, likewise, at an early period, was led by an irresistible inclination, to mathematics.

When this talent is predominant in an individual, all the other operations of the mind take their character from it. I know a physician, gifted with a great development of the organ of calculation, who endeavours to bring home the study of medicine, and even the virtue of medical articles, to mathematical principles. One of my friends, a mathematician and philologist, has long sought a universal language, likewise founded on mathematical principles.

### *Faculty of Numbers in the State of Disease.*

Two persons of my acquaintance, every time they had been engaged several days in succession in difficult calculations, felt a pain in that region of the head where the organ of numbers is found.

M. de Lagny, all whose works manifest a great geometrician, being on the point of expiring, Maupertius asked him what was the square of twelve; the dying man answered without hesitation, an hundred and forty-four. I saw in the asylum at Vienna a madman, whose insanity had degenerated into idiotism. His only occupation was to count, but he always

stopped at ninety-nine ; I tried in vain ; I never could induce him to say an hundred ; he always began again to count one. Mr. L. A. Gœlis, in his excellent treatise on acute and chronic hydrocephalus, thus expresses himself: "The physiologist, will never explain how, by the side of a complete destruction of all the faculties of the soul, a single faculty may manifest itself in all its force. The son of a farrier, although stupid in every other respect, still, at his twelfth year, manifested an astonishing memory of numbers and a peculiar benevolence. These two qualities disappeared in proportion as his disease, the hydrocephalus, increased."

These are certainly unanswerable proofs, that the functions of the organ of numbers are independent of those of the other organs.

*Seat and external Appearance of the Organ of Numbers.*

The organ of the faculty of numbers is formed by the convolution XIX. Pl. IV. V. VIII. XIII. This convolution is a continuation of the lowest convolution of the organ of music, and it is placed on the most external lateral part of the orbital plate, in a furrow or depression, which is the direction from before backwards. When this convolution has acquired a very favorable development, the external part of the plate is found depressed by it, in such a manner, that the superior orbital arch is no longer regular, except in its internal part, and its external half represents a straight line, which decends obliquely. Pl. LXXXVII. fig. 3, portrait of Monge. Hence it follows, that the external part of the eyelid is depressed, and conceals the corresponding part of the eye. This character is still more infallible, when the external part of the orbit is found at the same time removed outwards, so that the salient angle of the superciliary arch extends

beyond the anterior parts of the temple, as is seen in the cranium of the celebrated mechanic, Voigt-lænder, Pl. LXXXVIII. But this projection does not exist, when the lateral parts are rendered very prominent by a great development, either of the organ of music, or of that of construction.

After having acquired an exact knowledge of the form and place of this organ, let any one observe those men, who have distinguished themselves in the mathematics, by their creative genius. I know, personally, a great number of living mathematicians, and I have studied the busts, portraits, and engravings of many others. I find in all, without exception, the organ I have just described. Examine the portrait of young Colburn, Pl. LXXXVII. fig. 1. In him, the external part of the orbital plate is so much depressed and pushed outward, that this conformation has not escaped the author of the first notices on this young man, inserted in the American journals. Let any one observe the busts and portraits of Euclid, Archimedes, Galileo, Pl. LXXXII. fig. 3; of Kepler, Newton, Leibnitz, Peter Gassendi, Huyghens, Sully, Descartes, fig. 5; of Euler, Roberval, Lagny, Bernouilli, Lagrange, Laplace, Tralles, Lalande, fig. 4; of Herschel, Olbers, Bessel, Boetzenberg, Egmeier, Monge, Carnot, Jedediah Buxton, Pl. LXXXVII. fig. 2; of Bürgss, Body, of Messrs. Prony, Arago, &c.

When we know the physical conditions, under which the talent for mathematics has thus far constantly manifested itself, it may be concluded, without fear of mistake, that it will always manifest itself hereafter under the same conditions.

Some physicians of Paris, in order to try me, brought me three boys, one of whom was distinguished by an extraordinary facility for calculation; hardly had these children entered the room, when I pointed out the calculator.

It is not necessary to say, that the faculty of numbers and of magnitude, will find a different applica-

tion, according as it is accompanied by some organs greatly developed, or by others. It is according to these variations, that he who is endowed with them will be a geometrician, geographer, optician, astronomer, mechanician, maker of mathematical instruments, or composer of music. There is not, perhaps, any great composer, who is not endowed at the same time with the organ of the faculty of the relation of tones and that of calculation.

Usually, this organ is less developed in women than in men. Yet there exist examples of women who had great facility for calculation, and who have distinguished themselves in mathematics. Negroes have rarely strong dispositions for calculation and mathematics; accordingly their heads are almost always narrow, compressed in the region of the organ of calculation. Dr. Spurzheim believes, that the organ of numbers is generally developed in the English. Is this development the consequence of habitual exercise, or does the taste for commercial speculations belong to the development of this organ?

There exists, at Paris, a man whose intelligence, it is true, is in general limited enough, but who is so destitute of the talent of combining numbers, that it has always been impossible to make him comprehend that two and two make four, or that two and one make three. I have taken a cast of the head of this man, which is remarkable for the almost total want of development of the organ of the faculty of numbers.

### *Are Animals endowed with the Faculty of Numbers?*

I will not decide whether animals count; whether they have a determinate idea of numbers.

“Beasts count, that is certain,” says Leroy, “and although till now their arithmetic appears limited enough, perhaps one might give to it greater extent. In countries where they preserve game with care,



they make war on the magpies, because they carry off the eggs and destroy the hopes of the progeny. They therefore carefully mark the nests of these destructive birds; and in order to annihilate the ravenous family, they endeavour to kill the mother while she sits. Among these dams there are some restless ones, who desert their nests as soon as any one approaches. Then they are obliged to make an ambush well covered, at the foot of the tree on which the nest is, and a man places himself in the ambush to await the return of the sitting bird; but he waits in vain. If they have failed to kill the magpie in the first attempt, she knows, that the thunder must come from the cave where she has seen the man enter. While maternal tenderness keeps her sight fixed on the nest, fear deters her from it, until night can secure her from the fowler. To deceive this unquiet bird, the plan has been adopted of sending to the ambush two men, of whom one placed himself there and the other appeared; but the magpie counts, and keeps herself still away. The next day three go, and she sees that only two retire. Finally it is necessary, that five or six men going to the ambush put her calculation at fault. The magpie who believes, that this collection of men has only passed by, returns without delay. This phenomenon, renewed every time it is tried, must be placed in the rank of the most ordinary phenomena of the sagacity of animals."

Dupont de Nemours even maintains, that the magpie counts up to nine.

It is thought, that the hen counts her eggs, and the bitch her pups. It is certain that the bitch perceives when one of her young ones has been taken from her. But I do not suppose, that for this purpose she has any need of counting them. When we find ourselves in a company of few persons, and some one has retired, we perceive his absence without having counted the number of persons; the bitch might likewise have perceived the absence of one of her young, for the sole reason, that she knows each of them individually.

*On the Faculty of Time. (Zeit-sinn.)*

There are persons who have a great facility for retaining dates and epochs. They know the day of births, marriages, deaths, the epoch of all events, even the least remarkable. They commence all their stories by mentioning the year and the day. What they best know of history, is the periods. The jesuit Denis Peteau applied himself especially to chronology, and gained a name in this department, which eclipsed that of almost all the sages of Europe. In his portrait, the organ of numbers is very apparent. The senior Degmayer, at Augsburg, is generally known by his facility for retaining the dates of all events, the days of births, marriages, deaths, &c. From his infancy he had a decided inclination for mathematics; he has also the external mark of it very decided. I ask if this faculty belongs to that of numbers, of calculation, or whether it is necessary to seek for it a particular organ?

There are persons who in lying down are able to fix exactly the time they wish to sleep, and awake precisely at the moment they had fixed. Certain musicians, though they have a great talent for music, can never keep time: others, on the contrary, without having a talent for music, never miss it; so that this difference seems to constitute an essential difference between musicians. There are also individuals who have no perception of the rhythm of verses without rhyme. We see persons who find amusement in a collection of watches and clocks, and must have them all go with the greatest exactness. It appears, that there is no idea of time with those insane persons, who remain days and weeks fixed at the same place. A madman at Vienna had but one fixed idea, namely, that it was always the 17th of October. It often happens in mental alienation, as in other grievous diseases, that the idea of time is completely destroyed.

When these patients recover, they begin to count the time from the moment, when they regained the distinct perception of their existence. After twenty-seven years of seclusion and of mania, a lady experienced a revolution favorable to her moral state. Her delirium and madness continued during this space of time, to the extent of tearing her clothes, of remaining naked, &c. At the moment of the cessation of her delirium, she appeared to come out as from a profound dream, and asked after two young children which she had previous to her alienation, and could not conceive, that they had been married several years previous.

Can animals measure time ?

“ Animals,” says Buffon, “ can have no idea of time, no knowledge of the past, no notion of the future.”

C. G. Leroy has already well refuted this assertion of Buffon.

What constitutes in us the measure of time, is the succession of the ideas or sensations with which we have been struck, and which leave some trace in our memory. It is certain, that animals having fewer ideas than we have, there must be fewer degrees marked on the scale with which they measure time ; but they must necessarily have some idea of it, since they foresee and mark its periodical returns.

All animals which rise at certain hours to eat, and there are many, are faithful to them, not however as a clock which strikes the hours, but with the modifications, which the circumstances of the season or even of the day may occasion in their will.

When the ground uncovered by the harvest now completed, has forced the pheasants to collect in the covers in which they are kept, that is about the first of September, they live collected in flocks, and then they leave the wood twice a day to seek their food, which is called going to pasture. Nearly all start together at sunrise. When the sun begins to appear above the horizon, they soon finish their repast, there being an abundance of food, the heat which is felt, invites

them to return to the woods. They leave them again between five and six o'clock, and their supper continues until sunset. If the heat is less intense, and provision less abundant, they take their departure so much the earlier. When food becomes scarce, and the days are shorter, the pheasants go out only once a day, between nine and ten o'clock, and their meal continues until sunset. How should these birds execute these regular processes, if they did not measure the intervals of time?

The red partridges, though less intimately united, have the same habits as the pheasants: and the experienced fowlers know whether to look for them in the woods or the plains, according to the hour. Rabbits have this peculiarity, that the experience of the past gives them in some respects, in a more marked manner, a knowledge sufficiently correct for the future. During the summer they usually go out of their burrows some time before sunset, remain out a part of the night, and rise again generally about eight or nine in the morning, when it is not warm. But if you find almost all of them gone out, at two or three in the afternoon, if they eat very eagerly, if the attention they give to this, makes them more bold and less cautious than usual, you may be certain, that it will rain in the evening or in the night. The marked avidity of the rabbits is therefore an act of prudence; that is to say, in consequence of a sensation, which they have experienced and which they still experience, they judge of the future by the past.

Domestic animals have likewise a measure of time. The knowledge of the past enables them to judge of the future. The hour for their supply of grain is marked by the impatient neighing of the horses. Those who are either feeble or of vicious disposition, do not fail to make the greatest efforts to pass out of the places, where they have been accustomed to repose. They have therefore the consciousness of their past existence. Dogs, especially those ac-



customed to be led to the chase at an early hour, announce the moment by cries of impatience whenever any delay occurs. That of the departure is hailed by the liveliest cries of joy. The hunter is often annoyed by them, and has much trouble to control their impatience, especially when armed with his gun, he intimates to them the return of the sport of which they have so lively a recollection. Who does not know, that dogs and all domestic animals mark with impatience the moment, at which they are accustomed to receive their food? It is certain therefore, that they measure time.

But is there a peculiar organ for this measure, and where is its seat? Spurzheim is inclined to think, that its organ is placed above that of order, and near melody, to which it furnishes especial aid. When we shall have collected numerous observations of persons, who devote themselves with ardor to the pursuit of chronology, to time and dates, and carefully compound them with those made on the arithmeticians, we shall be better able to form a judgment in this matter.

## XIX. *Faculty of Constructiveness. (Kunst-sinn, Bau-sinn.)*

### *History of the Discovery.*

The same thing has happened to me respecting the faculty of constructiveness and its organ, as in regard to the faculty and organ of music. When I was first engaged in this subject, I was not fully persuaded, that each quality and each faculty depended on a particular part of the brain. It was this which induced me to give my attention to the whole form of the head of great mechanics. I was often struck by the circumstance, that the heads of these artists were as large in the temporal region as in that of the cheek-bone. This was not indeed a positive sign, but I often found it, and I was at last more and more convinced,

that the faculty of mechanism is also a particular fundamental faculty.

I applied myself principally to discover a certain external development. I every where sought to make the acquaintance of distinguished mechanics: I studied the form of their heads and moulded it. I soon met with some, in whom the diameter from one temporal to the other was much more considerable, than that from one zygomatic arch to the other. I finally met two very remarkable mechanics, in whom the temples were swollen into a large round cushion. These heads convinced me, that it is not the equality of the temporal and zygomatic diameters, which determines the genius for mechanics, but rather a large rounded protuberance placed in the temporal region, sometimes immediately behind the eye, sometimes a little above it. When I had assured myself of the seat of the organ and of its external appearance, I multiplied my observations; wherever I cast my eyes I found, both in our species and in animals, the most undeniable proofs, that the faculty of mechanics is a fundamental power. I will proceed to indicate the proofs.

*Natural History of the Faculty of Constructiveness  
in Animals.*

The tissue of the snail, the web of the spider, the hexagonal cells of the bee, the subterraneous galleries of the ant, of the mole, of the rabbit, the nests of birds and of the squirrel, the cabin of the beaver, &c., are so many masterpieces. What is the power which has created them?

The dog and the horse, so superior in many respects to the animals I have just named, have never, even in the moments of the greatest distress, manifested the least trace of instinct for building, or of any mechanical aptitude whatever. What, then, is the power which suggests to beings, so limited, the most inge-

nious means for their own preservation and that of their family?

Instinct? yes; without doubt an instinct; that is, an internal impulse; but it is not that instinct, which is the usual resource of closet philosophers and naturalists, in love with their own speculative ideas. It is a particular instinct, absolutely independent of every other species of internal impulse, and calculated expressly according to the peculiar relations, in which the animal is placed with the external world. The tissue of the snail is to secure it from the rain and the cold; the spider's web is to secure him his victim; the subterranean galleries of the mole are to serve for refuge and abode to her and her young. It was therefore necessary, that the organization of these beings should be in accordance with their wants, and reveal the primordial type of the works, which they were to execute abroad. Here again, therefore, there exists the same harmony between the laws of the external world and the internal organization of the animal, as in all the other fundamental qualities and faculties; here, again, we see in a small living organization, the type or the impress of a part of the external world.

Such is the only reasonable idea of the innate mechanical aptitudes. What would it avail the swallow and the thrush, to knead with water the clay which must give solidity to their nests, if the clay in drying was reduced to dust? It were in vain for the magpie to surround her nest with thorns, if the thorns did not prevent her enemies from approaching. It is the harmony, between the mechanical aptitudes of the animal and the objects without, which alone enables them to secure their existence against the dangers, which threaten them.

The action of this faculty, even in animals, is not subjected to the laws of a blind necessity. They vary, according to circumstances, the structure of their nests, of their galleries. The squirrels greatly modify their nests, and especially their habitations, in winter:

they vary in the choice of different materials, which they know each time how to bring into use in conformity with their purpose. In certain species, the mechanical aptitudes are reduced to inaction by captivity, and even by circumstances of little importance.

In others, they continue to manifest themselves, in a manner irresistibly, even under the most unfavorable circumstances. I have seen a weaving bird confined in a cage, who, at all seasons, interlaced the bars of his prison with hemp. The beavers, fed at Heilbrun near Salsbourg, and at Nymphenburg near Munich, chew branches of willow, amass them together, and cover them with mud.

What confirms the idea, that the aptitude to build is a particular faculty, is, that not only certain mammifera construct buildings for themselves and their young, and others do not, but that the same thing takes place among birds; the greater part of these last, it is true, build nests; but several, such as the horn owl (*strixotus* L.), the [effraie] (*strix flammea* L.), the screech-owl (*strix ulula*), the oyster-bird (*hœmatopus ostralegus* L.), the little sea lark of Buffon, do not build.

It is probable, that the climate exercises a peculiar influence on the organ of the instinct of building, as on several other qualities or faculties. It is maintained, that the beaver, which inhabited Gaul, did not build. The Lapland and Russian beavers are content, as it is said, to dig two burrows, one above the other, below the level of the water, and to make a gallery between them. They assert, that in certain countries the cuckoo builds a nest, and hatches its young itself. But it is reasonably asked, if, in these cases, there is a certainty as to the identity of the species, or if it is really the result of the influence of climate? Is it true that the bees, which were transported to Barbadoes and into the other islands of the Levant, ceased to make honey after the first year, because they found, that it was not necessary to them?



*Natural History of the Faculty of Constructiveness in Man.*

Man knows less of himself than of any thing else ; first, because he attributes all the qualities and faculties of animals to that pretended instinct, by which it is attempted to explain every thing ; and secondly, because he insulates himself absolutely from all the rest of the animal kingdom, and thus deprives himself of all points of comparison. Man makes clothing to cover himself ; by what impulse ? By that of necessity, to secure himself from the inclemency of the air and the stings of insects. He raises a cabin, a house, palaces, temples, because he finds it more convenient to be sheltered than to live in the open air, and because he wishes to satisfy his pride, or render homage to a being whom he considers above him ; he constructs machines, because his hands are insufficient to execute what he undertakes. All the productions of our industry are due to our intelligence and our wants. “Man appears to have nothing which resembles instinct ; no existing industry is produced by innate images ; all his acquirements are the result of his sensations, or those of his predecessors, transmitted by words, fertilized by meditation, applied to his wants and his enjoyments ; they have given him all the arts.”

Such is the language which all authors, if I except some philosophic observers, have held till now, in relation to all human action. If I were ambitious of the approbation of my contemporaries only, I ought to remain faithful to this routine.

In the first sections of the first volume, I have already proved, in general, the absurdity of this manner of regarding man ; and each of the fundamental qualities or faculties, of which I have treated, have furnished me new proofs of it. The following reflections will convince the reader, that the spirit of the

arts and of mechanical inventions, has also been given to man by a peculiar organization.

If the impressions previously received, our wants, reflection, reason, were the sources of our arts, their progress ought to be in direct proportion to the number of impressions received, to the urgency of our wants, and to the activity of our intellectual faculties. But if we consider the arts, either in individuals or in whole nations, we shall find that these circumstances may well determine the nature, the direction of our arts and of our inventions, and favor their progress; but by no means, give rise to the talent for them.

If we observe children, even those of the same family, assembled in the same school, surrounded by the same objects, and seeing the same examples; while some are devoted to their several pursuits, others are busy in drawing with charcoal, chalk, or pencil, different objects on the walls, the floor, on tables or paper, in cutting or fashioning different objects in wax, or in repairing the utensils of the house. Boys, from four to six years of age, have been seen to make an admirably exact model of a ship of the line. Hardly has the young Vaucanson seen the motion of a clock through an opening in its case, when he makes a wooden clock, without any other tool than a bad knife. The son of Reichenbacher, engineer for mathematical instruments, at Munich, from the age of five years, had his lathe to himself, disdained all the sports of his age, and would absolutely employ himself in what relates to mechanics only: his father had likewise the same exclusive inclination from his earliest infancy. At Mulhausen, in Switzerland, the manufacturers will receive into their shops only those children, who from their tenderest age discover a great talent for the arts in drawing and cutting; because they know by experience, that such subjects alone become intelligent workmen.

Examine the history of great mechanicians, draughtsmen, painters, architects; you will not find one, who

has not manifested the traces of his innate talent, from his earliest age. Lebrun, at the age of three years, employed himself in drawing with charcoal; at twelve years, he made the portrait of his grandfather. Christopher Wren, at the age of thirteen years, had made an ingenious machine to represent the course of the stars. Truchet, the father, was yet a child when he executed small machines, which announced what he would one day become. Michael Angelo was born a painter; at the age of sixteen, he executed works which were compared to those of antiquity. In his tenderest childhood, they used to find Peter du Laar, surnamed Bamboche, continually employed in drawing every thing he saw. His memory recalled to him with fidelity, even after a long time, the objects which he had seen but once. John Laurent Bernin, at the age of ten years, was able to make a head in marble, which gained him the approbation of all the connoisseurs. André Montaigne was destined to become a shepherd; his genius led him to higher objects; he passed all his time in tracing figures on stone or paper.

M. Berré (John Baptist,) born at Anvers, son of a tailor, being left to himself, learned drawing without a master, and against the will of all who had authority over him in his early childhood. He first made flowers, then tried himself in the class of animals of the chase, dead animals. He came to Paris to improve himself, painted lions and other carnivorous animals, and finally attached himself to the school of Paul Potter. He excels in the painting of domestic animals, cows, horses, &c., which he places either in rustic situations, or in the midst of rural buildings. He himself prepares his means of study, by sculpturing models, and forming reliefs of cows and stags on a small scale, without having prepared himself for it by preliminary studies.

A young artist, who, at this moment gives evidence of a great talent for sculpture, while a child and with-

out any idea of the existence of this art, engaged in carving crucifixes for the use of the laborers, and thus gained a little income, to procure himself the means of improvement. Every body is acquainted with similar examples.

The greater part of the great artists have not received an appropriate education, but, on the contrary, have had to struggle against want and obstacles of every kind ; while thousands of painters, sculptors, architects, and mechanics, who have never raised themselves above mediocrity, have had as much, and often more aid than the Claude Perraults, the Poussins, the Raphaels, Pl. LXXXV fig. 5 ; the Truchets, the Michael Angelos, Pl. LXXXV. fig. 6 ; the Anthemiuses, Wrens, Mansards, Nanteuils, &c.

How often have men, whom external circumstances prevented from devoting themselves professionally to the occupations, to which their natural dispositions called them, made them an amusement even in the whirl of affairs of a very different kind ? Leopold I., Peter the Great, and Louis XVI., made clocks ; the monk Platt employed the dust of the wings of butterflies to paint birds ; and his paintings deceive so completely, that you think you see a real bird. Peasants have been seen to make orreries, that is, machines indicating the course of the stars.

Father Vincent, a peasant who inhabits a cottage at a league from Plombières, having one day come into that city to sell some goods, heard from the street the sound of an instrument which was unknown to him. He asked permission to enter the house from which the sound proceeded ; it was granted him ; he was introduced into an apartment, where a lady was playing on the piano. Ravished into ecstasy, he wished to know this instrument in all its detail ; they satisfied his curiosity ; he examined it with much attention ; and after having comprehended the whole and the different parts, he said that he could make one like it. In fact, without any other aid than some



coarse tools, such as a plane, a hammer, and a file, he made, alone, the case, the wires, the keys, and put all together with marvellous industry. The forms, the proportions were observed. He afterward made two others, which have not the elegance of the pianos of Erard, but which are worth many of those which bear the names of well-known makers.

This was not all; after this trial, he wished to have a clock. He examined one, and made all the pieces, which he joined, and gave them all the regularity which a good clock-maker could have done.

This success did not puff up father Vincent. Another would have quitted the spade and the plough; but this rustic Vaucanson continued to cultivate his field, contenting himself with employing his new talent in his leisure moments, and solely to procure himself some enjoyment, or to ornament his house.

We every where see men, occupying eminent places, relax themselves from their habitual occupations by working at the lathe or in drawing. This taste cannot be attributed to peculiar feelings, nor to necessity, nor to very distinguished intellectual faculties.

On the contrary, we often see men endowed with very distinguished intellectual faculties, who absolutely know not how to do any thing with their hands. Lucian and Socrates renounced sculpture, because they did not feel any inclination for this art. M. Schurer, formerly professor of physics at Strasburgh, broke every thing he touched. There are persons who do not know how to mend a pen or sharpen a razor. Two of my friends, the one an excellent instructor, the other a great minister, were passionately fond of gardening, but I could never teach them to graft a tree.

On the other hand, the greatest mechanics are astonishingly limited in capacity as respects every thing else. The greater part of them, like all geniuses, are ordinarily great masters without suspecting it.

I close by making the remark, that the exercise of

the mechanical aptitudes takes place the more servilely, and in a manner the more invariable, as the animal is placed lower down on the scale of perfection; on the contrary, the higher he is placed, the more liberty has he in the exercise of these aptitudes. The nest of the squirrel offers much more variety than the envelope of the caterpillar; it is thus, that we see this apparent freedom go on increasing in the proportion of the organization in general, and of the organ of art in particular, until we arrive at length at the draughtsman, the painter, the sculptor, the architect, the mechanician, who believe, that in the exercise of their art, they have not subjected themselves to any fetter; yet the limits, assigned in this respect to the human race, do not escape the eye of the philosophic observer, who compares the works of one artist with those of another; the works of the ancients with those of the moderns; the works of one nation with those of another.

Finally, I am far from denying, that exercise and models serve to perfect the products of art, as well as every thing else. But, as Ferguson says, "All the skill which man acquires in the space of many ages, is only the development of the talent, which he possessed from the earliest times. The hut of the Scythian offers to the eyes of Vitruvius the elements of architecture; the bow, the sling, and the savage canoe, present to the armorer and the builder the original constructions of their trade."

### *Faculty of Constructiveness in Disease.*

It is not rare to see idiots, who manifest an astonishing talent for mechanics.

Pinel relates the example already quoted of a madman, who imagined, that his head had been changed, and who made the most ingenious machines, which were the result of the most profound combinations.

Doctor Spurzheim mentions the case of a woman on whom the organ of constructiveness, whenever she became pregnant, was in such a state of excitement, that she had actually a mania for building. Doctor Rush cites two cases, in which the talent for drawing showed itself during madness, and adds that there is no insane hospital in which we do not find examples of individuals, who, having never before shown the least trace of mechanical talent, have constructed the most curious machines, and even ships completely furnished.

*Seat and external Appearance of the Organ of the Arts in Man.*

It is the convolution VII. rolled in a spiral, Pl. IV. v. VIII., which constitutes this organ. In Pl. VIII. it is almost half covered by the very considerably developed convolutions of the middle lobes. When it has acquired a considerable development, it manifests itself in the cranium by a protuberance in the form of a segment of a sphere, the base of which has an inch and more in diameter. It is placed sometimes a little higher, or a little lower, according as the neighbouring organs are more or less developed immediately behind the organ of music, and above that of numbers. An unpractised eye might easily confound it with the organ of the propensity to acquire;\* but the form of this last is lengthened from behind forwards, and when the cushion which it forms is very considerable, it extends to the external edge of the superciliary arch. The protuberance formed by the organ of the arts is, on the contrary, round, and placed above that of the organ of the sense of property.\* See Pl. LXXXV. fig. 5, the portrait of Raphael, and fig. 6, that of Michael Angelo.

---

\* Acquisitiveness.—Ed.

We sometimes meet with great mechanical talents, which, instead of having the temporal regions as prominent as the zygomatic, have them rather contracted. This is in consequence of the deficient development of the organs, placed in the anterior lateral part of the forehead.

This protuberance gives to the temples a prominence equal to that of the zygomatic regions; on this account great mechanics have a head apparently enclosed between two parallel planes. In very distinguished artists this region is extremely prominent, and appears like a cushion, which engravers, painters, and sculptors regard as a deformity, and therefore never express it in its whole development.

At Vienna, several very respectable men brought me a subject, on which they begged me to give them my opinion. I told them, that he must have a great genius for mechanics; these gentlemen thought I was mistaken, but the person in question was much struck by my decision; it was the famous painter Unterberger. To give evidence, that I had judged correctly, he declared that he had always had a passionate taste for mechanics, and that the art of painting, which he exercised, was only his trade; he carried us into his house, where he showed us several large apartments filled with machines and instruments, which he had partly invented, partly brought to perfection. Moreover drawing, so necessary to the painter, depends on the organ of constructiveness.

Doctor Scheel of Copenhagen had attended one of my courses at Vienna; thence he went to Rome. One day he suddenly entered my house when I was surrounded by my pupils, and presented me a skull in plaster, on which he begged me to give him my opinion. I immediately exclaimed, that I had never seen the organ of constructiveness developed to the degree, that it was in this cranium. Scheel continued to question me. I requested those present to observe a considerable development of the organ of



Physical Love, and that of Imitation. "How," continued he, "do you find the organ of coloring?" I had not paid attention to it, for it was only moderately developed. M. Scheel then declared, with all the marks of the most lively joy, that it was the cast of the skull of Raphael which he had just sent me, and that, during his residence in Italy, he had found my ideas confirmed by the study of the antiques.

Many of my hearers spoke to me of a man endowed with an extraordinary genius for mechanics. I described to them beforehand the form, which his head ought to have, and we went to find him. It was the skilful inventor of mathematical instruments at Vienna. His temples were swollen into two misshapen cushions. Before this, I had found nearly the same form in the head of the celebrated mechanic and astronomer David, an Augustine friar, and of the famous Voigtländer, maker of mathematical instruments.

At Paris the Prince of Schwartzemberg, then minister of Austria, wished to put M. Spurzheim and myself to the test. At the moment when we rose from table, he led me into a neighbouring apartment, and introduced to me a young man without saying a single word. I went to rejoin the company with the Prince, and begged M. Spurzheim to examine the young man; during his absence I told the company what I thought of him. Spurzheim had hardly seen the individual, when he came to join us in the parlour, and likewise declared, that he thought him a great mechanician, or, a great artist in some similar department. In fact the Prince had induced him to come to Paris on account of his great talent for mechanics, and furnished him the means to prosecute his studies there.

At Vienna and in the whole course of our travels, we found among all the mechanicians, architects, draughtsmen, and sculptors, this organ developed in proportion to their talent: for example, in Messrs. Fischer and Zauner, sculptors at Vienna; Grosch,

engraver at Copenhagen ; Pløetz, painter ; Hause, architect ; Block, at Wurtzburg ; Canova ; Müller, engraver ; Danecker, sculptor at Stuttgart ; Baumann, maker of mathematical and astronomical instruments ; in a young man, whose instruction the late king of Wurtemberg had confided to Danecker, because he had observed in him a great talent for mechanics ; in Hoeslein at Augsburg, who in 1807 had constructed, from description alone, an hydraulic engine, which, with an inclination of two feet, raised water more than forty feet ; Ottony and Pflug at Jena ; Hueber, drawer of insects at Augsburg ; Baader and Reichenbacher, at Munich ; Baron Drais, inventor of the velocipede, and of a new system of calculation ; Bréguet and Régnier, at Paris, &c.

It is then on this organ, and not at all on the number and nature of the sensations, nor on the degree of the intellectual faculties in general, still less on the hands, that the talent of the artist depends ; and Lessing is perfectly correct in saying, that Raphael would have been a great painter, even if he had been born without hands.

*Observations on Constructiveness in the Arts, and its Organ in Man.*

The reader will have no trouble to determine, what ought to result from the combination of the organ of the arts with the other organs. From its combination with the organ of numbers, which exists in friar David, Voigtländer, Lindner, Bréguet, &c., results the talent for those branches of mechanics, which require great calculations ; from that with the organ of music results the talent of the inventor and maker of musical instruments, &c. There are also those different combinations, which determine the talent of the engraver, painter, sculptor, &c., for such a department in particular, for history, battles, religious, voluptuous subjects, &c.

Climate appears to act on this organ as on the others; that is, sometimes it favors its development, and sometimes it thwarts it. The models and the lessons of a master will never be able to supply, what heaven has denied the pupil. Already, in the sixteenth and seventeenth centuries, many artists of all countries used to go to Rome; yet there never returned from that city a Raphael, nor a Michael Angelo, nor a Leonardo da Vinci, nor a Carracci, in regard to drawing. Even Rubens, notwithstanding all his genius, all the fire of his imagination, and the profound study he had made of the antique, of history, and anatomy, cannot be placed in the first rank for composition and drawing.

The Italians seem to be endowed with a talent for drawing, better developed than that of the inhabitants of more northern climes, as the Flemish, the Germans, &c. This is the reason, why Italy has more and greater painters of history, than any other country; for, in this department, the faculty of the arts is more essential than that of colors. Almost all the Italian painters have sketched their pictures either with white chalk, or with brown and white crayons; many among them have sketched them only with the pen; we often find the outlines corrected; we never find them colored; a very strong proof, that they have worked only by the inspiration of the faculty of the arts. Most of the Italian prints betray a very pure taste in regard to outline, as well as the study of anatomy; frequently the subjects are such, that it would be impossible to treat them, without being endowed, to a high degree, with the faculty of the arts.

We see, without difficulty, how far these observations may be extended; and how interesting it will one day be, to compare the heads and the skulls of different nations, in regard to their talents for the arts.

It is then proved by experience, that the faculty of the arts, as well as its organ, may have acquired a very high degree of activity from infancy, while the other qualities or faculties are much less developed; that

the faculty of constructiveness may, at every age, exist to a degree of activity very different from that of the other qualities or faculties; that it may continue to manifest itself, and even with energy, when the other faculties are degraded to idiocy; that it may manifest itself in mania, and even appear in all its integrity; an unusually active faculty of constructiveness may be transmitted from father to son, and even to the grandson; that certain species of animals are endowed with it, while other species, though placed higher in the scale, are wholly destitute of it.

The faculty of constructiveness must, therefore, be considered as a particular faculty, independent of all the others; that is to say, a fundamental faculty; it ought, then, to have its organ.

Now, then, if we cannot deny either the facts which I have just related, or the consequences which flow from them, it must be admitted, that the objects on which this organ is destined to act, exist without us; that, consequently, there exist laws of motion, drawing, sculpture, taste; in fine, that this organ of the faculty of the arts, is only the material condition, by means of which the Creator places us in communication with this part of the world, and by the aid of which, he has wished to reveal to us this fragment of the universe.

It would be, I think, very superfluous to prove, that these laws exist in the external world. Every person, who has studied the first elements of physics, knows the laws of equilibrium and of motion; and it is not expected, that I should develop the laws of painting, sculpture, and architecture.\*

---

\* "Independent of Greek architecture which all nations have adopted," says Mr. J. F. Sobry, in his *Practice of the Arts*, p. 374, "there exist also many other kinds of architecture, such as the Egyptian, the Chinese, the Gothic, and the Arabesque.

"All these kinds of architecture are very distinct, and yet they all set out from the same principle, which is the primitive construction; they refer themselves to it in their details." And p. 584: The "Chinese, like all other nations, have palaces, gates, aqueducts, triumphal arches;



But what I have just said must convince every person, who is not irrevocably attached to received ideas, that the arts are not a product of our sensations and reflections; that, on the contrary, they are really an institution of nature.

Thus far, in speaking of the arts, I have made mention neither of composition nor expression; because these objects relate to other faculties of which I shall speak hereafter. It remains to me to speak of the organ of construction in animals.

### *Of the Organ of Constructiveness in Animals.*

This organ, however little it may be developed, is most of the time very easy to recognise in man; but as in the great part of the animal species, sometimes these organs, sometimes others, exist or are wanting, in the anterior inferior region of the head, there must hence result many variations in the form of the regions where the organ of construction is placed. It must have, in the animal whose organs of localities, of music, and of construction are at the same time much developed, a different form from what it assumes in an animal which is endowed solely with the organ of construction, or with this organ accompanied with one only of the two preceding.

This organ in general is very difficult to distinguish in most of those animals, who burrow or build. Those who have not yet acquired full knowledge of comparative anatomy, must not commence the study of organology, either with the organ of the faculty of localities, or with the organ of the relation of tones, or with that of construction. In man, these organs are placed higher in the head, and have a perpendicu-

---

and all the ornaments of these buildings are equally drawn from the primitive constructions; manner and customs in vain put differences in the forms; we find every where the same principle."

lar direction. In animals, as they are destitute of several intermediate organs, and in general their organs are smaller, these three are placed lower, and their direction is horizontal.

The practised observer, as I have already shown for the organs of localities and of music, will also discover the organ of construction in animals, and will not confound this with the other two. The organ of music in animals is placed towards the middle of the orbitar arch; that of construction is farther back. Moreover, the organ of localities is farther forward; and though sometimes, as in the mammifera, on the external angle of the frontal, it yet always occupies the superior region of the forehead; whereas the organ of construction is not only more retreating, but more depressed towards the sides.

In the hamster, Pl. LXXII. fig. 9, the marmot, Pl. LXX. fig. 7, the beaver, fig. 8, it is very easy to recognise the organ of construction. The crania, too, of these three animals greatly resemble each other in the region where this organ is placed. In general, we must seek it in all the *rodentia* immediately above and before the base of the zygomatic arch. The more highly these animals are endowed with the instinct of building, the more prominent is this region of the cranium.

Now, we shall find, without difficulty, the answer to the following question. Why does not the hare, which, as far as concerns his limbs, resembles the rabbit, burrow in the same manner? Compare this region of the cranium with that of the other, and you will be convinced, that in the rabbit it forms a prominence, while in the hare it is depressed. We find the same difference in the crania of birds who build nests, and those who do not. The best means perhaps to familiarize one's self with this organ, is to compare animals of the same genus, of which some species build, while others do not. Thus, in comparing the head of the rabbit with that of the hare, the species

of birds that build nests with those that do not, we gain a complete conviction of the existence and seat of this organ. In regard to the organ of music, I have said, that it was necessary to compare, not only the singing birds in general with those that do not sing, but especially the birds of the same genus, of which certain species sing, while others do not. For example, there is among the different species of tomtits, several which sing, and others destitute of this power. There are blackbirds that have no note, and others that sing marvellously well. Among the falcons, we know only a single species that sings well, the musical hawk, (*falco musicus*.) We shall obtain the same result in comparing the head of our beaver, which, left to its instinct, builds so well, with the head of another species of beaver, which is said to be destitute of that instinct.

Though the head of the badger and of the mole in the region alluded to, have a sensible prominence, it is, notwithstanding, very difficult to observe, unless one is very familiar with this organization.

The more we familiarize ourselves with the organization of the brain of the different species of animals, and the more knowledge we acquire in regard to their instincts, the more we shall be convinced of the truth of organology.

Several of my adversaries have declared themselves against the idea, that it is the same fundamental faculty, which leads the beaver to build his house, a milliner to invent her fashions, and Raphael to conceive his immortal designs. To put thee, divine Raphael, on the same ground with the hamster, the beaver, and the milliner! Professional wits may attach some importance to such observations, but the philosophic naturalist knows very well, that a power expressed in one instance by three, in another by a million, may be very different in its modifications, though its nature remains the same.

“May there not be,” says Demangeon, “in some

unexplored region of the brain, bundles of fibres still unknown, and fit to explain the differences of mechanical industry? For, it is difficult to believe, that the little circular swelling which is perceived behind the organ of music, in the direction of the external angle of the orbit, is sufficient for the varied conceptions of the field-mouse, the beaver, the bird which builds nests, the architect, the statuary, the draughtsman, the machinist, the clockmaker, and of so ingenious a mechanism as that of the Vaucansons and the Maelzels. What surprises me is, that an organ, circumscribed in so small a space at the base of the brain, can control all those of which it requires the aid, to the extent of subduing them to itself and impressing its own seal upon them."

Demangeon finds it hard to believe, that a little circular swelling can suffice to the conceptions of the field-mouse, the beaver, the building bird, &c. Is it more easy for him to conceive, that the little brain of the ant, the bee, the spider, the field-mouse, the penduline, is sufficient, not only for their mechanical instincts, but also for their other instincts, so varied and so astonishing? How long has the philosopher thought himself justified in demanding of nature, what ought to be the dimensions of such or such an organ, in order to produce such or such an effect?

After having treated of the faculty of coloring, of music, of arts, of constructiveness, &c., it appears to me superfluous to notice at length, how much those are in error, who say of the sense of sight, that it becomes for man the source of sublime ideas and of several liberal arts, such as painting, sculpture, architecture, mimicry or pantomime, &c., and who attributes to the touch, our superiority over the brutes.



*Intellectual Faculties and Moral Qualities, most of which essentially distinguish the Human Race from all the other Species of Animals.*

The instincts, propensities, talents, or the moral qualities and intellectual faculties which I have hitherto considered, are all found, at least, in their rudiments, in animals. But it is only man, who unites them all, though no one is exclusively his property. All the organs of these faculties, as I have shown, are placed in the inferior anterior parts, and the inferior anterior lateral parts of the brain, and however elevated, in proportion to the extent of their functions, they may be above those of animals, however marvellous may be their results, we can point them out only under the denomination of organs of inferior intellectual faculties, which man has in common with a great number of brutes.

My readers, after having so long seen man associated with animals, will finally be impatient to know, what are then the moral qualities and intellectual faculties, which give to man his immense superiority over animals? What are the qualities and the faculties which constitute the essential distinctive character of humanity?

Nothing is so easy as the answer to this important question, for those who still love to believe, that animals are only machines, automatons, destitute of all perception, of all consciousness, of every moral and intellectual principle. On this supposition, man alone is endowed with an immaterial principle, and possessed of will and reason. It is the soul which gives exclusively to man the character of humanity. Every ulterior research is forbidden, and would tend to compromise the dignity of our species.

We cut short the difficulty in the same manner, when we consent to grant to brutes, consciousness, propensities, memory, judgment, but maintain, that all

their qualities and faculties are either material powers, or the result of an occult principle, of a vital principle independent of organism, a substitute for a soul; while the same powers in man emanate from a spiritual substance, equally independent on the exercise of its powers and on organization.

Those, on the contrary, who thoroughly examine things, and who desire to oppose truth to error and superstition, find the problem of the distinctive character of man, surrounded by the greatest difficulties. The more we have followed animals in the exercise of their instincts, inclinations, and faculties, the more the difficulty of determining the boundaries of their knowledge, increases. How often do the astonishing perfectibility and the mute acts of the dog, the elephant, the ourang-outang present the most illusory images of the intelligence and morality of man! Many philosophic naturalists have not feared to maintain, that the human species differs from the other species of animals, only in its capacity of knowing and adoring a God.

In order to obtain a reasonable opinion amidst this uncertainty, and not to engage myself in the search of primary principles, or in questions impossible to solve, the eternal obstacle to every positive discovery, I still limit myself to material conditions, having recourse to the comparative anatomy and physiology of the brain. We have already seen how much more voluminous the brain of man, in its anterior inferior parts, is than that of animals; we have also seen how much the functions of these cerebral parts are more extended and more perfect in man, than the functions of the same cerebral region in brutes. Now compare the anterior superior part of the forehead of man with the heads of animals. While the anterior inferior parts of the brain in animals fail only by the want of development, the anterior superior parts are entirely wanting in them. In man, the forehead rises to a height much more considerable, than in any of the

animals even the most perfect. Besides, the cerebral parts of this region, as well as the forehead, advance more or less beyond the orbits. What a striking fact, for those who are convinced of the intimate relation, which exists between physical and moral nature, between the cerebral organization and its most noble functions!

It is this region of the brain, that we are going to analyze; it is there, that we shall discover the material cause of the distinctive character of man. After having studied, one after another, each of the fragments of which the whole moral and intellectual character of man is composed; after having shown physically, that each new moral or intellectual power is constantly and necessarily accompanied by a new cerebral part proper to man alone; we shall be able to say with the satisfaction arising from the highest probability, here is the barrier between man and animal; it is here, that mere animal nature terminates, and humanity commences! And I shall have proved, that the surest and the most fruitful method of studying man, is the successive study of the organs of the brain.

We have said, elsewhere, that the frontal bone is divided in its anterior part, its superior part, and in its lateral parts. The organs, placed in the anterior inferior part and anterior inferior lateral part, have been explained in the first section. It remains to inquire, what are the organs which are placed in the anterior, superior, and the anterior superior lateral parts of the frontal bone. I begin by the examination of that which occupies the median line, and to which, consequently, nature appears to have attached the highest degree of importance.

XX. *Comparative Sagacity, Aptitude for Drawing Comparisons.* (*Vergleichender Scharf-sinn.*)

*History of the Discovery.*

I often used to entertain myself on philosophic subjects with a philosopher, endowed with great mental vivacity. Whenever he was embarrassed to prove the truth of his assertion, rigorously, he had recourse to a comparison. By this means he, in a manner, painted his ideas, and his opponents were often thrown off the track and led away; an effect, which it would not have been possible for him to produce by his arguments.

As soon as I perceived, that this custom was a characteristic trait with him, I examined the form of his head. I already knew, that we ought not to seek the external marks of intellectual powers among the organs of animal sentiment, but on the forehead; and I observed in the external superior middle part of the frontal bone, a great lengthened prominence, to which I had not given attention till that moment. This prominence commenced in the anterior superior middle part of the forehead, where it was about an inch broad, and contracting itself in the form of a cone, reached the middle of the forehead, where it touched the organ of educability.

I then sought for men who followed the same method in their discourses or writings, to see if they had the same organization. On the other hand, I ascertained the progress of the mind in persons, in whom I remarked the same protuberance. All my observations confirmed my supposition. I concluded, therefore, that there exists a connexion between the great development of the cerebral part placed under this protuberance, and the faculty of finding analogies, resemblances, &c.

At the same period I observed the heads of two ex-jesuits, both distinguished preachers, who were equally



esteemed by the educated and by the common classes. In their sermons, by the aid of combinations of comparisons and of parables, they rendered clear, and in a degree evident, the precepts, which they wished to inculcate on their hearers. At a later period I also examined the head of the famous father Barhammer, Pl. LXXXIII. fig. 2, a preacher much followed by the people. Arguments were not his forte, but in a style (*à la père Abraham*)\* little elevated or refined, he knew how to keep the attention of his audience alive, by numerous comparisons, always taken from objects best known in common life. I have often seen half of the faithful assembled fall asleep, or at least remain very indifferent to the sermons of preachers, much more eloquent, but who made use of philosophical reasonings. The minds of men but little educated, are incapable of following a long series of arguments; but comparisons, parables, spread a gentle and beneficent light, produce the effect of conviction, and carry along the most clownish multitude.

In these three heads, the middle anterior superior part of the forehead was likewise vaulted into a conical eminence. The more my observations of this kind were multiplied, the more I was convinced, that the tendency of a mind to seek comparisons, analogies, &c., results from the favorable development of a particular organ.

*Farther proofs that the Faculty of Comparison is founded on the Action of the Middle Cerebral part of the Anterior Superior Region of the Forehead.*

In treating of the fundamental faculties, which exclusively belong to man, I have not at my disposal so many proofs, as for those which are common to man and animals. All the resources, which comparative anatomy and physiology afford me, to sustain

---

\* Franklin, Almanac.

my assertion, in relation to the organs of which I have treated hitherto, now fail me ; and I am obliged henceforward, to confine myself to man alone : and man being infinitely more complicated than animals, and consequently more difficult to observe, it becomes more than ever necessary to multiply facts, and to draw inferences with the most judicious reserve.

Sagacity and wit are commonly regarded as two faculties, not only very distinct, but even opposite. It is maintained that sagacity (*Scharf-sinn*) or *perspicacity*, consists in seizing contrasts, and wit, (*Witz*) in finding resemblances. But, as he, who has the faculty to discover resemblances between different objects, must necessarily also seize their contrasts, it follows that both of these faculties are modifications of the same fundamental powers.

The expression perspicacity, sagacity, spirit of comparison, seems to me to designate exactly this operation of our understanding. I remark in general, that persons, in whom this cerebral part has acquired a high degree of development, seize and judge well the relations of things, of circumstances, and events, and are generally well fitted for business.

Children, in whom this organ is considerably developed, prefer fables to all other subjects taught them. I own a bust of La Fontaine, in which this part is extremely developed, and the other parts are smaller than they appear in the prints. My bust coincides with that in baked clay, which is seen at the museum of French monuments.

I have often said to individuals in whom I found this organization to a high degree ; *in your writings, and even in your letters, in your discussions, you make frequent use of comparisons.* After some moments of reflection, they acknowledged within themselves this peculiar tendency, which they had not till that moment suspected. On making at Frankfort the acquaintance of the famous preacher Hufnagel, (Pl. LXXXIII. fig. 1,) we saw, that he had this organ very

much developed; and it was with lively joy, that we saw it at Weimar greatly developed on the forehead of Goethe; accordingly we find analogies and comparisons, on every page of the writings of this fine genius.

This organ is in general of great use to poets; with it every thing becomes an image, so that certain poets attribute their talent entirely to the faculty of speaking by images, and have not the least idea of what really constitutes poetical talent. I find this organ much developed in the bust of those of the ancients, who have distinguished themselves by their sagacity; for example, in that of Cato, Solon, Pl. LXXXVII. fig. 6, Macænas.

Saint Thomas Aquinas, (Pl. LXXXVII. fig. 4,) of all the scholars of barbarous times, was without question, the most profound, the most judicious, and the clearest; accordingly the organ of comparative perspicacity is very visible on his forehead.

The head of St. Francis de Sales (Pl. LXXXVII. fig. 5,) is in general very handsome, very elevated, high, and of an extremely noble character; but we observe especially a great development of the organ of comparative perspicacity, and large, depressed eyes, such as are usually found among philologists. Accordingly, he shows every where great erudition, and there is not a page of his introduction to a devout life, in which we do not find some analogies and even some sustained comparisons. I open the volume, I fall on page 164, and I read; "If we are punctilious for rank, precedence, titles, besides exposing our qualities to examination, to inquiry, to contradiction, we render them vile and abject; for the honor, which is noble when received as a gift, becomes mean when exacted, sought, and demanded. When a peacock spreads his tail to exhibit his fine feathers, he bristles up all the rest, and shows all his most inferior parts: the flowers, which are beautiful while planted in the ground, fade when handled. And as those who smell the mandrake

at a distance, and in passing receive pleasure from the odor, and those who approach closely become stupefied and sick, so honors give a sweet consolation to him who smells them gently from afar, without amusing himself with them or caring for them; but to him who attaches himself to them and feeds on them, they become extremely offensive and prejudicial."

So true is it, that man betrays the secret of his organization in his thoughts and his writings.

### *On the Education of the Human Race.*

What can have been the object of the Creator, or of nature, in placing this organ in the median line, where the most essential organs are always found? Let me be permitted here to make a philosophical digression; it may be pardoned, I think, to a man who is persuaded, that organization is the principal source of psychological phenomena.

I have said that, by the aid of the organ of comparative sagacity, man makes comparisons; that is, by the aid of this organ he recognises the resemblances and differences of objects. Now, it is certain that it is precisely by this means, that the education of the human race commences. Man has a natural propensity to compare his feelings with the impressions he receives from without, and the same impressions with the sensations he experiences within. By means of these comparisons his sentiments and impressions are converted, not only into ideas, but also into images and pictures; by this means his language does not limit itself to a collection of material sounds without life; it becomes an animated, and, if we may so speak, a personified language. By means of such a language, man is enabled to communicate, that is, to paint to his fellow men his feelings, as well as the impressions he has received; this is the spirit which reigns in all mother tongues; it is the organ of hieroglyphics, and



of all signs which imitate objects more or less; it is for this reason that, even now, the rudest men, in order to communicate their sentiments, make use of emblems, that they paint a heart with flames escaping from it, an arrow, &c. This, in fine, is the origin of mythology.

Man, in comparing together the impressions which he has received from abroad, endeavours to imitate them by his language; he becomes an imitator, a painter of the external world. The horse *neighs*, the lion *roars*, the sheep *bleats*, the frog *croaks*, the ox *lows*, the dog *barks*, the wolf *growls*, the cat *mews*, the turtle dove *coos*, the hog *grunts*, the hen *clucks*, the serpent *hisses*, the hand-bell *tinkles*, the thunder *roars*, &c.; words which imitate the sound they express. It is thus, that a number of words take birth in the parent languages, and have been transferred into those languages, which are derived from them.

Man acts likewise in regard to his own sentiments. He familiarizes himself with these, as easily as with impressions received from without. Why then do so many philosophers derive our first ideas from impressions on the five senses? The internal sentiments furnish the materials for our language, as early and as abundantly. The sentiments also require to be painted, and the images by which we depict external objects, are as often derived from these sentiments, as those, by which the sentiments are pictured, are from external objects. If we say, the blood *boils*; the heart *palpitates* and *beats*; the soul *burns* and *freezes*; beauty *fades*; that *tears* my soul; that *pierces* my heart; reason *seizes*; the mind *penetrates*; he has a *light*, a *heavy* understanding; *sharp* or *dull* faculties; a *narrow* mind; the heart *corrupted*, *hard*, *broken*, *tender*; *ripe* reason; the soul *prostrated*; a *flat* expression; we also say the vine *weeps*; the weather is *dull*; the sea *rages*; the billows *roar*; the winds *howl*; the oak *braves* the storm; he lifts towards heaven an *audacious*

*front* ; rust *gnaws* the iron ; the sun *vivifies* ; nature *awakes* ; the earth is *thirsty* ; the willow *loves* moisture ; the vine *fears* the frost, &c.

Almost all proverbs, and all popular modes of speaking, are but comparisons and analogies, arising from accidental observations. The singed cat fears cold water ; to put the cart before the horse ; to let the wolf into the fold ; to strike while the iron is hot ; to straighten the tree while it is young ; a good name is better than a golden girdle ; idleness is like rust, it consumes faster than labor ; a rolling stone gathers no moss ; you laugh in your sleep, but you will weep at your waking ; what is not good for the swarm, cannot be good for the bee.

Now, it will be conceived, why those, who had it more at heart to render a service to humanity, than to gain the reputation of a brilliant eloquence in the instructions which they addressed to the people, preferred the form of the parable, and emblematic modes of speaking to every other. This was the vulgar language of the Egyptians, and Pythagoras enveloped his precepts of morality in the veil of allegory and apologue. Let us recollect the woman who seeks the penny she has lost, and who has such great joy in finding it ; — the shepherd who abandons his flock to go and seek the stray sheep. — “ Ye are the salt of the earth ; but if the salt have lost its savor, wherewith shall it be salted ? It is good for nothing but to be cast out and to be trodden under foot of men. — Ye are the light of the world ; a city that is set on a hill cannot be hid ; neither do men light a candle and put it under a bushel, but on a candlestick, and it gives light to all that are in the house, &c. — Behold the fowls of the air ; they sow not, neither reap, nor gather into barns, &c. — Consider the lilies of the field, how they grow ; they toil not, neither do they spin. — You shall know them by their fruits. — Do men gather grapes of thorns, or figs of thistles ? A good tree cannot bring forth bad fruits, nor a bad tree, good fruits. —

The wise man built his house on the rock, and the rain descended, and the floods came, and the wind blew and beat upon it, and it fell not, for it was founded on a rock. — The foolish man built his house on the sand ; and the rain fell, and the floods came, and the winds blew and beat upon it, and it fell, and great was the fall of it.” —

“ When a woman is in travail.....likewise you are now in distress.”

“ I have given you milk to drink, and have not given you meat ; for you were not able to bear it.”

We find on each page the most excellent comparisons, in which we manifestly see the intention. “ I have spoken to you in parables.” It is thus, that the most wholesome truths are best introduced under the veil of fable.

Æsop, who assumed the mask of allegory and the charm of fable, was more listened to at the court of Cræsus, than the austere Solon. A senator appeased the sedition of the Roman people by a fable, which the wisdom and authority of the consuls had not been able to repress. And the courtiers of Louis XIV. were more willing to be corrected by the apologues of La Fontaine, by the comic fictions of Molière, and by the poignant pictures of La Bruyere, than by the sublime and profound thoughts of Pascal.

What philosopher would have spoken better to the ambitious, than Petrarch, when he says to them : To look to power, in order to live in security and at rest, is to ascend a high mountain to avoid the winds and the thunder.

We may then maintain, that the education of the human race has been commenced principally by means of the action of the organ of comparative sagacity. Now we may conceive, why nature has placed it in the median line.

*Metaphysical Depth of Thought : Aptitude for drawing Conclusions. (Metaphysischer Tief-sinn.)*

I have a long time observed, that some men, to whom a great philosophic spirit is attributed, had the anterior superior part of the forehead singularly large and prominent. Such are Socrates, Democritus, Cicero, Bacon, Montaigne, Galileo, La Bruyere, Leibnitz, Condillac, Diderot, Mendelsohn, &c.

But the tendency of the profound genius in these men, is not the same in all of them. The domain of one, is the material world ; the domain of another, is the spiritual. One wishes to know what is ; endeavours to discover the conditions, under which that which is, exists ; makes observation the basis of all his meditations, and investigates the relation of cause and effect ; another, disdaining the material world, raises himself into the world of spirits ; and, creating to himself a universe of ideal beings, contemplates mind in its effects as mind, and takes no account of the material conditions of its functions ; he is occupied in the investigation of general truths, of general principles ; and, according to him, all which exists here below ought to conform to these general ideas ; such is the ideologist, the metaphysician.

In these heads two cerebral parts are developed, one on each side, XXIII. Pl. IX. at the side of the organ of comparative sagacity. In those the parts of the forehead which immediately touch these cerebral parts, are found prominent, and form, by themselves alone, or jointly with the organ of sagacity, two segments of a sphere, placed on each side of the forehead in the horizontal line.

At Vienna I knew men endowed with very distinguished intellectual faculties, zealous followers of Kant. The too great generality of the assertions, which constitute their doctrine, always convinced me, that it is without any practical utility. Their dogma,



for example, that time and space are only a form to which our understanding is subjected, appears to me so general, that it finds no application to any science or any art. It is on this account, that they and myself have never been able to understand each other. They reproached me, as the followers of the transcendental philosophy have since done in the rest of Germany, with not having raised myself above the lowest step in the ladder of observation. In return, I reproached them with losing themselves in the void beyond the limits of the sensible world; with wishing to determine the laws of the corporeal world according to those of the spiritual; and with constructing the whole external world with pretended materials, collected within themselves, instead of making observation the basis of their reasonings.

During our travels, they gave us a cast, moulded on the head of Kant after his death. It was with a lively pleasure, that we saw the extraordinary prominence of the two frontal parts which I have pointed out. See his portrait, Pl. LXXXII. fig. 3. Afterward, we became acquainted with Fichte, and found the same region of his forehead still more prominent than in Kant. We saw the same organization in Schelling; we need take no notice here of those numerous followers, who do nothing but repeat the words of their master.

It seems to be proved by experience, that so long as man is condemned to inhabit this earth, there is no advantage to be drawn by him from the speculations of this sublime philosophy, and consequently that we shall do well to confine ourselves within that sphere of activity, which the world of realities offers us.

Sometimes, it is true, we are forced to admire the depth of the human mind, when, at distant intervals, we see those men, if not by the sole force of reasoning, at least by induction from a small number of data, discover truths, to which the naturalist dares not give his consent till after a numerous and painful succession

of experiments. Still these results, as brilliant as rare, are bright rays of light, doubtless, but such as it is very difficult to distinguish from the meteors, which usually dazzle the mind of the metaphysician.

The ancients probably had already perceived the relation, which exists between this organization, and the tendency to be occupied with things beyond the reach of the senses, and consequently beyond the sphere of observation. They give to their Jupiter Capitolinus the same prominence in the anterior middle superior part of the forehead; a characteristic mark, which suits perfectly with supreme intelligence,

I am far from denying, that *interior intuition* may likewise become an object of observation; but when I see, that this intuition leads, in each individual, to different conclusions, and tends, consequently, to no certain observation; when I see, that in the midst of the corporeal world, in the midst of institutions founded on matter and on bodies, metaphysicians, as Berkeley did more than a century since, go so far as to call in doubt the existence of matter, by the most puerile sophisms, whether in the intention of repelling the charge of materialism, or because by a similar extravagance they pretend to raise themselves above the humble observer of nature; when I see in all ages the efforts as frivolous as profound, of the ideologist, to destroy and renew themselves by turns; when I see, that the metaphysicians by profession, affect an aversion for researches on man, such as he is; I doubt whether such an employment of the metaphysical spirit could ever pretend to any other merit, than that of simple speculation.

## XXII. *Wit.* (*Witz.*)

A third peculiar manifestation of the intellectual faculty, is what the Germans have called *witz*, and the English, *wit*. I know of no French word which

accurately expresses the same idea. This faculty considers objects under a point of view altogether peculiar, finds in them relations altogether peculiar, and presents them in a manner altogether peculiar, which constitutes what is called *salt*, *causticity*, and sometimes *naïveté*. To give my readers a just idea of this faculty, I see no better means than to cite men whose dominant faculty was what I suppose this to be; such was Lucian, the Voltaire of the Greeks, both by his boldness and by the turn of his mind; Rabelais, Cervantes, Marot, Boileau, Racine, Régnier, Swift, Sterne, Voltaire, Piron, Rabener, Wieland, &c.

In all persons eminently endowed with this faculty, whom I have had occasion to examine, I have found the anterior superior lateral parts of the forehead considerably prominent, in a segment of a sphere.

When this organization predominates, it carries with it an irresistible propensity to ridicule every thing; to spare neither friend nor brother; and as there are persons who, for want of better subjects, rob themselves, so there are found those who, for want of other objects, launch their satire against themselves.

Aristophanes was so bitter, that he did not spare his own family. Socrates and Euripides were the butts of his sarcasms. Henry IV. has been blamed for being too fond of jesting; he has been reproached for his gaiety in the midst of a combat, for his jests in poverty and misfortune, and for the sometimes untimely sallies of his lively mind.

Baron Grimm said of Piron; "This poet was a machine for sallies, epigrams, flashes of wit. In examining him closely, it was seen that these things were entangled one with another in his head, came out involuntarily, urged themselves confusedly on his lips, and that it was no more possible for him to avoid uttering *bon mots*, and epigrams by the dozen, than it was to avoid breathing. Piron was a real study for the philosopher."

Mathurin Régnier showed, from his youth, his propensity to satire. His father chastised him several times to correct him. Punishments, prayers, all were useless.

Diogenes, the cynic, a biting wit, amused himself with all the follies of the age.

Cicero had an extreme inclination to raillery. Horace, a merry philosopher of the court of Augustus, usually manages his satire with delicacy. Juvenal, the unrelenting censor of the reign of Domitian, destroys all that he touches.

If we consider the busts and the portraits of Diogenes, Aristophanes, Henry IV., Cicero, Cervantes, Rabelais, Pl. LXXXIII. fig. 4; of Boileau, Racine, Régnier, Swift, Piron, fig. 5; of Sterne, fig. 6; Voltaire, Pl. LXXXIV. fig. 4; of Wieland, &c., we shall find in all of them, the anterior superior lateral part of the forehead projecting into two segments of a sphere.

Other persons want this talent, and sometimes to such a degree, that, like Crebillon, they hate and despise whatever is satire or epigram. In this case, the same region of the forehead is contracted. (Pl. LXXXII. fig. 5.)

It is therefore no longer permitted to doubt, that this talent is indicated by the organization, which I have described. The manner in which it manifests itself, whether by offensive sarcasms, or by jests without bitterness, the choice of its subjects, &c., all this depends on the greater or less development of other organs.

It is the convolutions, XXIV. Pl. VIII. fig. 9, which constitute the organ of wit.

"The spirit of wit," says Demangeon, "this Proteus of the understanding which assumes all forms to produce gaiety, marking with its seal all the sciences and all the arts, by striking contrasts, irony, raillery, ridicule, pleasantry, punning, buffoonry, satire, the grotesque, caricature, &c., this wit, which sports with all the faculties, has it really its principle in a single organ? I think it must depend on several cerebral apparatus



and that having gaiety for its essence, it is perhaps only the result of a happy organic symmetry, by which each faculty obtains its share of activity and satisfaction. It seems, besides, that this wit manifests itself only by contrasts or comparisons, and Mr. Gall admits no peculiar organ for comparison, nor for contrast of which he makes a common attribute. The thing then would be very well designated in French by the single word, *esprit*, under which we comprehend all the intellectual faculties, in whatever they present most prominent and least studied."

Thus Demangeon still reduces all the intellectual faculties to a single faculty, designated by the word *esprit*. It is apparently in the dictionary of the academy, that Demangeon has gained this information. We have the idle spirit, and the active spirit, the light spirit, and the heavy spirit, the easy spirit and the dull, the brilliant and the dry, the fruitful and the sterile, the unquiet, factious, turbulent, capricious, insinuating, supple; there is the spirit of gaming, of chicanery, of sophism, of business; there is a good and an evil spirit, an *esprit fort*, a *bel esprit*; one has much spirit, but little judgment; one has not the spirit to seize the spirit of a work, or of a discourse, &c. This *esprit*, therefore, suffices to give one all the moral qualities and intellectual faculties; hence, a single organ of *esprit* is the wonderful organ of the most opposite propensities and talents. But how happens it, that, with an abundance of *esprit* one so often has no decided talent? That with the most obstinate spirit of generalization, one has no exact knowledge, no precise notion? If the spirit of repartee depends on several cerebral apparatus, and having gaiety for its essence, is perhaps only a result of a happy organic symmetry, by which each faculty obtains its portion of activity and satisfaction; then every buffoon, every farce player, or harlequin, &c., must be a perfect man; and every man of talents must be more or less a buffoon or a farce player.

In all his objections, Demangeon forgets the reciprocal influence, which the different organs exert on each other. Certainly, according as the caustic spirit is accompanied with other faculties or other dominant propensities, it will exercise itself in a thousand modified modes on other objects, &c.

*Causality, Spirit of Induction, Philosophic Head.*  
(*Causalität, Folgerungs-Vermögen.*)

In discussing (VOL. II.) the means of knowing the measure of intelligence, I showed, that with the same volume of brain, different individuals may have very different moral qualities and intellectual faculties. If it be required to know, what are the most active qualities and faculties in an individual, the volume of the cerebral mass is no longer the object of consideration ; it is necessary to know, what are the parts of the brain, which in this individual have acquired the greatest development. Already, sect. III. of the same volume, I had indicated the different results, according as the different regions of the brain are more favorably developed than others. I have likewise shown, that the more or less general contraction of the brain, involves the deadening of all the qualities and faculties ; idiocy, more or less complete ; a preponderating development of the organs, which belong to the functions common to man and to animals, subjects man to the empire of the animal qualities. Free will is the more restrained, as the faculties, proper to man, are less active. The propensities are only very feebly counterbalanced. If a man, with such an organization, distinguishes himself, it is by qualities of an inferior order, by brutal sensuality, by ambition, the love of conquest, the instinct of destruction, or by the rage for combats, &c.

Few men have been destined to play a great part, either in regard to animal qualities, or in regard

to intellectual faculties. In the greater part, the moral and intellectual powers are confined to a rather narrow sphere of activity. To beget children, to bestow the first cares upon one's offspring, to gain a livelihood by some labor, to cultivate the earth, to fish and to hunt, to obey the strongest, to defend one's property and country, to give himself up to gross enjoyments, these are the occupations of the majority, and which require a very feeble exertion of the characteristic faculties of our species. Accordingly it is demonstrated by the most constant observation, that the frontal region, where we have seen the seat of the distinctive faculties of man, rarely surpasses a very moderate degree of development. How should elevated thoughts, profound views, a fondness for the arts and sciences, arise in these individuals? The propensities and the sentiments alone are keenly felt; because commonly their organs are much more voluminous, than those of the intellectual faculties. It is not reasoning, it is the propensities and the feelings, which influence their judgments and determine their actions. It is as easy to lead, as it is difficult to convince them. The too feeble development of the anterior superior cerebral parts, leads them to false judgments, to credulity, prejudice, and superstition. Hence a blind confidence in the imaginary power of the most frivolous things, in talismans, amulets, (gris-gris,) scapulaires, dreams, oracles, favorable or unfavorable presages attached to the meeting of certain objects presented by chance; hence, the confidence felt in the cries of nocturnal birds, in the flight of a raven, in the entrails of an animal, in the auguries of fortune tellers, the power of socery and of witchcraft, &c. &c.

And if such weaknesses are rather the characteristic of the female sex, otherwise well-instructed, and very talented, the reason is, that usually the anterior superior cerebral parts acquire a much less development in women, than in men, and that, consequently they hardly realize, that there can be no effect, no event, without a cause.

In proportion as the cerebral parts, placed in the anterior superior region of the forehead, are more developed, the characteristic faculties of the human mind are more fully expanded. The man raises himself more and more, not only above the brute, but also above the crowd of his fellow-men.

We have just exhibited the results of the very favorable, but insulated development of the different cerebral parts of this region. These partial developments do not yet embrace all the extent of human intelligence. The views, although profound, are likewise still partial; and again, certain relations of things always escape these incomplete intellectual geniuses. These are the Pythagorases, the Heraclituses, the Anaxagorases, the Pyrrhos, the Democrituses, the Portas, Spinosas, Lockes, Malebranches. Berkeleys, Helvetiuses, and generally the authors of the most celebrated aberrations of the human mind.

But nature has not ordained, that our species should be always and entirely abandoned to error. No one, it is true, has the privilege of being secure against the assaults of illusion. Yet there sometimes exists an organization of the anterior superior cerebral parts sufficiently happy, to secure the best disposition of the intellectual faculties. In the same manner as, by an extraordinary development of certain parts of the posterior region of the brain, certain individuals gain the government over others, others again are called by a uniform and extraordinary development of all the organs placed in the anterior superior region of the brain, to constitute themselves the instructors of the human race. It is by means of this organization, that the true philosopher seeks the wisdom of the world. It is this organization, which involves the necessity and the faculty of discovering the relations which exist between an effect, a phenomenon, and its cause; of pursuing a long series of data: of embracing a vast field of observation; of subjecting some to others; of discerning the unknown by means of the



known ; of comparing facts ; of eliminating what is accidental, and recognising what is constant ; of determining the laws of phenomena ; of establishing principles and deducing their consequences ; of ascending from particular facts and consequences to general laws, to principles ; from effects to causes, and to descend from principles, from general laws to consequences, to particular facts ; from causes to effects ; of enriching nations with new truths ; of spreading like a fire the beneficent rays of his light ; of breaking the yoke of despotism and destroying the machinations of imposture.

It is *reason* then, the result of a happy development of all the anterior superior cerebral parts, which constitutes the essence of man, the true barrier which separates man from the brute. Though certain animals take advantage of the combination of events, they never elevate themselves to the discovery of general laws ; they never gain general principles.

It is therefore, also, the different degree of development of the same cerebral parts, which, in respect to the intellectual faculties, distinguishes man from man. And if it has been given to the philosopher to penetrate the sanctuary of truth, he also acknowledges that the empire of prejudice, superstitions, and dissensions will endure for ever ; since these moderate organizations must be perpetual.

My readers will now perceive how one may have a quality, a talent very much distinguished, be, for example, an excellent musician, mathematician, architect, poet, warrior, &c., and in regard to the philosophic spirit, be confined to the most absolute mediocrity.

The philosopher will direct his views to different objects, according as other organs still exercise a very energetic influence. Hence the class of pious philosophers, as Pascal, Bonnet, Montaigne, professor Sailer of Landshut ; hence the natural philosophers, the poetical philosophers, Homer, Lucretius, Horace, Voltaire, &c.

Now examine the heads, portraits, busts of great philosophers of all ages, of Socrates, Pl. xcii. fig. 1; of Plato, fig. 2; of Bacon, Pl. lxxxii. fig. 6; of Galileo, fig. 4; of Leibnitz, Pl. xcii. fig. 3; of Wolff, Voltaire, Rousseau, Diderot, &c., and we shall no longer be astonished, that the artists of antiquity had already perfectly caught the organization or the form of the head of men, extraordinary for the development of their intellectual faculties.

Compare the cerebral organization of men, most distinguished for the development of their superior intellectual faculties, with the almost universal organization of women, and you will be satisfied that the inferiority of women, in this respect, is neither owing to the education they receive, nor to certain inconveniences peculiar to them; but solely to the less development of the cerebral parts placed in the anterior superior region of the forehead; this is the organic cause. As to its effect or physiological result, as I would not risk being disgraced with the fair sex, and as at 65 one stands more than ever in need of its good offices, I will adopt the words of a medical philosopher, who, for many years must have accustomed himself to dispense with the favor of the ladies.

"The differences," says Cabanis, "observed in the turn of ideas or in the passions of men and women, correspond to those, which we have remarked in the organization of the two sexes, and in their mode of feeling. There is no doubt, in their mode of feeling, a great number of things common to both, which refer themselves to human nature in general; but there are several essentially different, and it is these last which belong to the peculiar nature of the sexes. The point of view, under which objects present themselves to us, cannot fail greatly to influence the judgment we pass upon them; now besides, that woman does not feel as man, she finds herself in different relations with all nature, and her manner of judging is relative to other ends and other plans, as well as founded on other considerations.

“ Judging differently of the objects which have not the same kind of interest for her, her attention does not make the same choice between them, she attaches herself only to those, which have relation to her wants to her faculties. Thus, while on the one hand she avoids painful and dangerous labors, while she limits herself to those which are more suited to her weakness, which exercise at the same time the delicate address of her fingers, the quickness of her glance, and the grace of all her movements; on the other hand, she is justly alarmed with those mental labors, which involve the necessity of long and profound meditation; she chooses those, which demand more tact than science, more vivacity of conception than force, more imagination than reasoning; those in which it is sufficient for a ready talent, to glance lightly over the surface of the objects.

“ She ought also to reserve to herself that part of moral philosophy, which bears directly on the observation of the human heart and of society; for, in vain does the art of the world cover both individuals and their passions with its uniform veil; the sagacity of woman easily distinguishes each trait and each shade. The continual interest of observing men and her rivals gives to this species of instinct a promptitude and a certainty, which the judgment of the wisest philosopher could never acquire. If it be permitted so to speak, her eye hears all words, her ear sees all movements; and, to complete her art, she knows how to conceal this continual observation under the appearance of heedlessness or a bashful reserve.

“ But, if the evil destiny of women, or the unfortunate admiration of misguided friends, urges them into a different path; if, not content with pleasing by the graces of a natural wit, by agreeable talents, by that social art which they doubtless possess to a higher degree than men, they wish also to astonish by displays of force, and join the triumph of science to gentler and surer conquests; then almost all their charm vanishes;

they cease to be what they are, in making vain efforts to become what they wish to appear ; and losing the attractions without which beauty itself can maintain neither certain nor durable empire, they gain nothing of science but its pedantry and affectation. In general, learned women know nothing thoroughly ; they ruin and confound all objects and all ideas. Their lively conception has seized some part, and they imagine they know the whole. Difficulties disgust them ; and their impatience overleaps them. Incapable of fixing their attention long enough on one thing, they cannot experience the lively and profound enjoyment of deep meditation ; and they are even incapable of it. They pass rapidly from one subject to another, and nothing remains to them but some partial incomplete notions, which usually form in their heads the most grotesque combinations.

“And for the small number of those who can obtain some real success in those departments altogether foreign to the faculties of their mind, it is perhaps yet worse. In youth, in maturity, in old age, what will be the place of those uncertain beings, who are not, properly speaking, of either sex ? By what attraction can they fix the young man who is seeking a companion ? What aid can infirm or aged parents expect from them ? What pleasures will they diffuse over the life of a husband ? Will they be seen to descend from the elevation of their genius, to watch over their children and their household ? All these so delicate relations, which make the charm and the happiness of woman, then exist no longer. By wishing to extend her empire she destroys it. In a word, the nature of things and experience equally prove, that, if the weakness of her muscles forbids woman to descend into the gymnasium and the race course, the qualities of her mind and the part which she ought to play in life, still more imperiously forbid her to exhibit herself in the lyceum or the portico.

“Some philosophers have been seen, however, who,



making no account of the primitive organization of women, have regarded their physical weakness as the effect of the kind of life which society imposes on them, and their inferiority in the sciences and in abstract philosophy, as depending solely on their deficient education. These philosophers have sustained themselves by some uncommon instances, which prove merely, that, in this respect as in others, nature may sometimes by accident pass her own limits. Besides, woman belonging to that species of living beings whose fibres are altogether the most supple and the strongest, is assuredly very susceptible of being modified by habits contrary to her original dispositions. But the question is, if other habits do not suit her better; if she does not answer them more naturally; if, when nothing accidental and predominant controls her natural tendency, she does not become such as I have said she ought to be? What is certain at least, is, that these extraordinary women, whom they oppose to us, were all more or less unfitted for the purpose assigned them by nature, and for the functions to which they ought to confine themselves, in order to fulfil it. It is certain, that in the midst of all this parade, man hardly perceives that which alone can attract and fix him. Now, the happiness of women will always depend on the impression they make on men; and I think that those who truly love them, will have no great pleasure in seeing them carrying the musket and marching to the charge, or teaching from the elevation of a pulpit, and still less from the tribunal, where the interests of a nation are discussed."

### XXIII. *Talent for Poetry. (Dichter Geist.)*

Every body allows that *poeta nascitur*, the poet is born a poet, because experience has proved that the poetical talent is not acquired. But it is of poetical genius as of the organ of the soul; every body agrees,

that the brain is the organ of the soul, and, from the moment when we attempt to define this assertion accurately, we constantly fall into contradictions. From the moment when I say, I am going to show that poetical talent is innate, that it is produced by the favorable development of a peculiar cerebral part, every body cries out against this idea, and the poets more than all the others.

For myself, I was for many years opposed to admitting this point of doctrine. I knew that poetical talent could not be acquired by studying the principles of the art; I knew that the poet found within himself the principles of his art, as the musician, without thinking of the laws of vibration and the relations of tones, reveals them in a manner, by the music which he creates; but I had a difficulty in conceiving, that there was a peculiar organ, whose exaltation determined the poetical talent. I saw in it only the result of the action of several other organs, endowed with great energy. If I had confined myself to this idea every body would have been of my opinion. Whenever I inquire of a poet, to what intellectual faculty he attributes his talent, he answers by enumerating a great number of faculties and acquisitions. A sure tact, he says, a refined taste, the faculty of representing by images, sentiments, ideas, events, and of offering an interesting picture of them, a fruitful and ardent imagination, invention, these are the elements which constitute the poet, and these elements themselves suppose several intellectual faculties.

But we must renounce this generally received opinion, if the most exact experience and observation belie it. I begin, then, by showing, that the poetical talent is not the result of several eminent intellectual faculties taken collectively; but that it depends on the energy of a peculiar fundamental faculty, whose manifestation may indeed be modified, but by no means determined from the first by other powers. Then I shall show, that a very favorable development of the

organ of this faculty is, in fact, met with in all the great poets.

Before all, however, I must observe to the reader, that we should not honor every versifier with the title of poet, as is too generally done. I well know that measure gives a certain charm to the subjects which poetry treats. I am not ignorant, that poetical genius ordinarily manifests itself in the first place by verses; but no one will deny that one may be a great poet in prose. The *Telemachus* of Fenelon, the *Idylls* and the *Death of Abel* of Gessner, are examples. The *Iliad* and *Odyssey*, translated by Bitaubé, the *Paradise Lost*, by Mosneron, are still poetry, though deprived of the charm of verse.

*A Talent for Poetry depends on the great Activity of a particular Fundamental Faculty.*

Poetry, like all other things for which we have received from nature a peculiar faculty, is subjected to certain laws. These laws have not been invented by man in order to be able to teach them to others; they are revealed to him by the aid of a peculiar organization. Whenever this organization has acquired all its fulness, or at least a considerable degree of activity, there result productions in which these laws are observed. Such productions only inform the observer of the existence of these laws, and they are collected for the use of those who are less happily organized.

This explains to us why certain individuals attain a high perfection in such or such a science or art, before having had the time to instruct themselves in its rules. It is thus with all poets possessed of great genius. The study of rules and models may modify the innate talent, and adapt it to circumstances and the taste of the times; but the talent itself is as independent of all these external modifications, as the

weight of the ball is independent of the shock received by the bodies, it strikes in its descent.

“This explains why there is no tribe of barbarians who have not their rhymes of passion or of history; why men, in the earliest periods of society, take delight in compositions in verse; why a savage, born a poet, clothes his conceptions with images and metaphors. ‘We have planted the tree of peace;’ says the American orator, ‘we have buried the hatchet under its roots; we will hereafter rest beneath its shade. We will join to extend the chain, which unites our nations.’ Such are the accumulated metaphors, with which the public harangues of these people are filled. Thus have they promptly adopted those lively figures, that liberty and boldness of style, which subsequently learned men have judged so proper to express the rapid transitions of the imagination, and the emotions of a passionate soul.

“In the earliest ages of Greece, priests, legislators, philosophers gave their instructions in verse; they joined to them the charm of music and of heroic fiction.

“That poetry should have been the first kind of composition among all nations, is a less surprising thing, doubtless, than to see a style, so different in appearance, and so removed from common usage, almost universally the first which arrives at maturity. The most admired of poets lived before the times of history, and, to use the expression, before the time of tradition. The artless songs of the savage, the heroic legends of the bards, have sometimes a beauty to which the perfection of language could add nothing, and in which the most refined criticism can find nothing to reform.

“Although in the conceptions of Homer the discernment is equal to the sublimity, we cannot go back beyond these times, and we see no light which announced the torch of his genius and the divine flame of his soul. What in others is invention, in him is inspiration; and we perceive, that it was not so



much reflection, as a natural instinct, which presided over the choice of his thoughts and expressions.

But, whatever be the propensity of men for poetry from the earliest times, whatever advantages they have for succeeding in this kind of literature, whether poetical compositions arrive first at perfection, only because they are the first cultivated, or whether poetry has a peculiar charm for those lively imaginations, which are best fitted to perfect the eloquence of their natural language ; it is a remarkable fact, that not only in those countries, where all kinds of composition are indigenous, and arise according to the order of natural progression, but even in Rome and modern Europe, where they have been introduced from abroad, we find, in all languages, poets who are read with pleasure, while the cotemporary prose writers present nothing worthy of attention.

“ In Greece, Sophocles and Euripides preceded the historians and the moralists. Among the Latins, not only Nævius and Ennius, who wrote the Roman history in verse, but Lucilius, Plautus, Terence, we might add Lucretius himself, were anterior to Cicero, Sallust, and Cæsar. Italy made her boast of Dante and Petrarch before she had a single good writer in prose. Corneille and Racine in France open the golden age of proaic composition ; and England had not only Chaucer and Spenser, but Shakspeare and Milton also, while her essays in science and history were yet in their cradle, and deserve consideration only from the subjects to which they relate.”

I have transcribed these passages, because they prove, that poetical talent depends rather on one active and independent faculty, than on any union of intellectual faculties. What Fergusson says of Homer is also applicable to Petrarch and Dante, who are perhaps as astonishing men as Homer ; like him they had no predecessors, no rivals ; like him, they came out already formed from the womb of that profound obscurity, in which their country was buried. It might

be said, that the day waited for them to appear, and then displayed itself suddenly in its full splendor.

It appears to me in general, that poetry is too jealous a divinity for art, study, imitation, to be able to supply its inspiration. I repeat it, study may enable the poet to conform himself to the taste of his age, and to avoid certain faults in execution ; but this is all. There are very few examples of distinguished poets, who have not found out their talent at a late period by some accidental circumstance. La Fontaine, for example, at twenty-two years was ignorant of his talent for poetry. The beautiful ode of Malherbe, on the death of Henry IV., made him feel from that moment, that he was a poet. The tragical end of Henry only made him attentive to a faculty, which, though it had not manifested itself till that moment, did not the less exist in all its force ; it did not create it.

Most generally the poetical talent manifests itself in early youth, or at least without any previous study relative to this subject, and in a great disproportion to the other intellectual faculties.

Pope, at twelve years of age, made an ode on rural life, which the English compare to the best odes of Horace. At fourteen, he produced some passages translated from Statius and Ovid, which they place by the side of their originals. At sixteen, he wrote pastorals worthy of Theocritus and Virgil.

Tasso, when only seven years of age, composed verses. At seventeen, he wrote his poem of Rinaldo. At twenty-two, he commenced his poem of Jerusalem Delivered, and finished it at thirty.

De la Grange-Chancel wrote a comedy in three acts at the age of nine years ; his tragedy of Jugurtha, at sixteen.

Richardson, at the age of twelve years, sketched the character of a lady who enjoyed a high reputation, and whom he suspected of profound hypocrisy.

Metastasio, at the age of ten years, made verses which astonished the connoisseurs ; he was only fourteen when he composed his first tragedy.

Voltaire made verses at the age of seven.

Billaud, a joiner known under the name of Master Adam, became a poet in his shop, without any knowledge of literature.

Every one knows the famous shoemaker poet of London. At Paris the shoemaker François, the author of the *Siege of Palmyra*, offers us a similar example. The latter had no sooner collected some historical notions on his subject, than he produced his tragedy in the style of Corneille. The productions of this astonishing man sufficiently prove, that he would have been a distinguished man in his nation, had not the ingratitude of his cotemporaries exiled him from Parnassus and confined him to his shop.

Neither in these last cases, nor in those where the poetic talent has shown itself from the earliest youth, can we say, that it is the union of several intellectual faculties, developed and cultivated by study, which constituted the genius of the poet.

The examples of men, who have withdrawn from their original destination, to devote themselves to poetry which they passionately loved, also prove, that this faculty is determined by a *tendency* of mind altogether peculiar.

Ovid was destined to the bar, but poetry possessed irresistible attractions for him. His father, fearing that his passion for verses would debar him from that fortune, which his talents promised him, wished in vain, that he should devote himself to speaking. Ovid was born a poet, and was such in spite of his father. *Et quod tentabam scribere versus erat.* Still, not to appear entirely to disdain the paternal counsel, he studied the orators and composed declamations. But his inclination for poetry predominated, and he reconciled himself to the muses.

Petrarch, also destined to the bar, soon conceived the greatest aversion to jurisprudence.

The friends of Cervantes wished to make him an ecclesiastic or a physician ; but he was born for poetry, and made verses in spite of them.

It was thus that Molière, subdued by his passion for verses and the theatre, triumphed over the opposition of his family, and became the first genius of his age.

Boileau, whom his father had placed with a notary, showing an invincible disgust for chicanery, it was proposed to him to become an ecclesiastic; but theology did not please him, and he resigned himself entirely to his inclination for making satires.

Schiller first studied jurisprudence, which he soon renounced in favor of surgery and medicine, with which he likewise became disgusted in a short time. Neither the remonstrances of his parents, the counsels of his friends, nor the absolute orders of his sovereign, could turn him from his dominant taste for poetry, the ancient languages, history, and the higher philosophy. He says in his works, speaking of himself; "Fortune, by one of her ridiculous caprices, wished to condemn me to be a poet in my native city. An irresistible inclination for poetry infringed the laws of the institution where I was educated, and thwarted the plan of its founder."

So much, adds the biographer, J. J. Berché, in men of superior genius, does all-powerful nature overcome the principles and even the object of education.

Whatever may be the talents and acquirements, which direct a distinguished poet in choice of his subjects, it is not the less certain, that these talents and acquirements do not constitute poetical genius; that, to make a poet, requires a particular faculty, independent of all others. But what constitutes the fundamental power on which this talent depends; that is, what functions does the organ of poetry fulfil in those cases, in which it has acquired only an ordinary degree of development? This I should not dare to decide. But I can affirm, that it is the considerable development of a determinate cerebral part, which produces poetical talent. I can indicate, with exactness, the region of the head where this cerebral part is placed, and de-



scribe the prominence, by which it manifests itself on the cranium.

*Of the Poetical Talent in Mania.*

"I was troubled, sometimes," says Pinel, "to follow the incorrigible garrulity and a sort of flow of unconnected and incoherent words of an old scholar, who, at other times, fell into a stern and savage silence. When any piece of poetry, in which he had formerly delighted, suggested itself to his memory, he became capable of continuous attention, his judgment seemed to regain its rights, and he composed verses, in which there reigned not only a spirit of order and of justness in the ideas, but also a regular supply of fancy and some very happy sallies." In another place the same author expresses himself thus:

"Certain facts appear so extraordinary, that they have need of being borne up by the most authentic testimony, in order not to be called in question. I speak of the poetical enthusiasm, which is said to have characterized certain paroxysms of mania, even when the verses recited, could nowise be regarded as an act of reminiscence. I have myself heard a maniac declaim, with grace and exquisite discernment, a longer or shorter succession of the verses of Virgil or Horace, which had been a long time effaced from his memory, inasmuch as, after his education was terminated, he had been twenty years absent in the American Colonies, given up to the pursuit of wealth, and the reverses, occasioned by the revolution, had alone thrown him into this distraction of mind. But the English author, whom I have already cited, attests that a young girl of a feeble constitution, and subject no nervous affections, had become insane, and that during her delirium she expressed herself in very harmonious English verses, though she had before shown no sort of disposition for poetry. Van Swie-

ten also relates another example of a woman, who, during her paroxysms of mania, showed 'a rare facility for versification, though she had before been occupied with manual labor, and her understanding had never been enriched by culture.'

We know that Tasso made his finest verses during his paroxysms of mania. How often are poets obliged to provoke inspirations by spirituous liquors, which they take to the extent of producing intoxication, or plunging themselves into a state of madness?

I have already spoken of one Leon, of Vienna, who, during the paroxysms of a nervous fever, made verses in the manner of Klopstock.

*Seat and external Appearance of the Organ, whose great Development produces the Talent for Poetry.*

The first poet, who struck me by the form of his head, was one of my friends, who often composed extempore verses when least expected to do so, and had thus gained for himself a kind of reputation, although, in other respects, an ordinary man. His forehead immediately above the nose, rose perpendicularly, then retreated and extended itself much laterally, as if a portion had been added to each side. I remembered having observed the same form of head in the bust of Ovid. In other poets, I did not always find this forehead first perpendicular and then retreating, so that I regarded this form of forehead as accidental. But in all, I remarked these prominences in the anterior lateral part of the head, above the temples. I began, thenceforth, to regard these prominences as the distinctive mark of poetical talent. Still I spoke of them to my hearers with the tone of doubt, and the more so, as I was not yet convinced at this period, that poetical talent was a fundamental faculty. I waited, therefore, before deciding definitely, till I had collected a larger number of observations.

Soon after, I procured the head of the poet Alxinger, in which this cerebral part, as well as the organ of attachment, is very much developed, while the other organs are only feebly so. Soon after the poet Junger died, I also found in his head the same prominences. I however saw these cerebral parts still more strongly developed in the poet Blumauer, who united to it the organ of sarcastic spirit. At this period Wilhelmine Maisch gained, at Vienna, a reputation by his poetry; I found in him the same enlargement above the temples. I found the same organization in Madame Laroche, at Offenbach, near Frankfort; in Angelica Kauffmann; in Sophia Clementina de Merken; in Klopstock; in Schiller, whose cast I own; we found it also very marked in Gesner, at Zurich.

When at Berlin, I spoke of this organ in my public lectures, always expressing myself with much reserve in regard to it; Nicolai invited Spurzheim and myself, to go and see a collection of nearly thirty busts of poets, which he possessed. To our great joy, we found in all, the region indicated, more or less prominent, according to the more or less decided talent of each poet.

From this moment I taught boldly, that, however improbable this assertion might seem, we must admit a peculiar organ for the talent of poetry, and that consequently poetical genius supposes a particular fundamental faculty.

All the observations, I had occasion to make afterward, confirmed this idea; and now I maintain without hesitation, that there never has existed, and never will exist a poet, in whom the cerebral parts referred to, are not very greatly developed.

At Paris I moulded the head of Legouve after his death, in which this part is likewise very decided. Spurzheim and myself opened the head of the late Delille, and pointed out to several physicians, who were present, the considerable development of the convolutions placed under the protuberances which I have

mentioned. They exceeded all the others. I have the cast of one of the hemispheres of his brain.

In a rather numerous company they asked me, in order to put organology to the test, what I thought of a little man at some distance from me. As it was dusky, I said, that in truth I could not see him very well; but however, that I distinguished, that he had the organ of poetry extremely developed; they then told me, with all the marks of astonishment, that it was the famous cordwainer-poet François. Afterwards I moulded his head, and I now exhibit his bust to my hearers, as having the external appearance of the organ of poetry.

In the brain it is convolution xxv. Pl. viii. and ix. which constitutes it.

By the considerable development of this convolution, there rises from each side of the cranium a prominence, which commences at about half the height of the forehead in front, above the temples, and extends obliquely from below upward, and from before backward, about two inches. These two lengthened protuberances give to the superior part of the head, a great breadth and so singular a form, that painters, engravers, and sculptors rarely venture to present them in all their prominence.

Now let us pass in review the portraits and the busts of poets of all ages, and we shall see, that this conformation is common to them all. I greatly regret, that the long hair of Corneille, and the ample peruke with which Racine is dressed, prevent our seeing these organs in them. But compare Pindar, Pl. xcii. fig. 5, Euripides, fig. 6, Sophocles, Heraclides, Plautus, Terence, Virgil, Tibullus, Ovid, Horace, Juvenal, Boccacio, Ariosto, Arétin, Tasso, Milton, Boileau, J. B. Rousseau, Pope, Young, Gresset, Voltaire, Gesner, Klopstock, Wieland, &c.

I found the same organization in the princess of Salm, in Messieurs Andrieux, Pl. xcii. fig. 4, Lemerrier, Dupaty, &c.



This is especially the form of Homer's head, which must strike every one ; its superior lateral part forms two extraordinary prominences. I am not ignorant that some *savans* have expressed doubts in regard to the authenticity of this bust, and consider it as ideal.

But whether it be an ideal composition or a portrait, the existence of these prominences is nevertheless a remarkable phenomenon. Why should this form have been given to the head of the father of poetry, if this head were not really the portrait of the author of the *Iliad* ? Doubts have likewise been raised in regard to the authenticity of Raphael's bust ; but the extraordinary development of the organ of the arts, joined to that of the organ of imitation, seems to me to prove, that it is really the portrait of this inimitable artist.

After all, if the bust of Homer is ideal, how has the artist been able to divine that form which, of so many innumerable conformations which nature offers, is the only true one ? Did he choose the most distinguished poet of his time, for the model of his bust of the author of the *Iliad* ? In this case the observations of the artist would serve as a confirmation of my discoveries.

In a hospital I found this organ rather developed in an insane man ; I said to the physicians who accompanied me, that I found in him the external mark which indicates a talent for poetry. He really had this talent ; for, in his state of alienation, he continually made verses which sometimes did not want vigor. This man was of the lowest class and without any education. We saw in the collection of Esquirol, the bust of a mad woman, who was continually making verses ; in this head the organ of poetry is considerably more developed than the others.

Now, if in all cases in which poetical talent is manifested to a high degree, the portion of the brain referred to is considerably developed ; if, with a great mediocrity of the other talents, the poetical talent may manifest itself alone to a high degree, (and in this case the cerebral portion in question is strongly marked,) if,

even in mania, in the heat of fever, this faculty may exist alone, or be alone in a state of inaction; cases of which I have adduced examples above; one must be the blind slave of received prejudices, not to acknowledge, that poetical talent is a fundamental faculty, and that the organ of this faculty is placed in the region, which I have pointed out.

If I am asked why poets choose subjects so various, why one writes romances, another tragedies, comedies, idyls, odes, epic poems, &c., let us remember, that this question presents itself for all the fundamental faculties. The musician, the painter, &c. choose such or such a subject, according as other organs are suited to the predominant organ. Poetical talent, joined with the sense of elevation, produces the odes of Pindar and of J. B. Rousseau; with the sense of devotion the Psalms of David, the *Paradise Lost*; with the instinct of murder, the tragedies of Shakespeare and Crebillon; with the instinct of physical love, the *Art of Love* of Ovid and of Gentil Bernard, the sportive works of Piron, of Grecourt, of Arétin; with the spirit of observation, Lucretius's work on the Nature of Things and Fenelon's *Telemachus*.

The bust of Quinault, the author of *Alcestes*, of *Theseus*, *Atys*, &c., presents the organ of music to a very high degree. This explains why Lully prefers him to all the other poets; he found in him alone all the qualities which he sought; a delicate ear which chose only harmonious words, a great facility for rhyming, and an extreme docility, to lend himself to the ideas of the musician.

These observations also prove that even the highest degree of activity of the other fundamental faculties, does not suffice to present the objects, with which they are occupied, clothed in the charms of poetry, and to create the poet in their department; for, in this case, every epicurean, great general, ambitious man, would be a poet. It requires a peculiar and proper

power to animate all the others with the sacred fire of Apollo.

XXIV. *Goodness, Benevolence, Gentleness, Compassion, Sensibility, Moral Sense, Conscience. (Gutmæthigkeit, Mitleiden, Moralischer-sinn, Gewissen.)*

As this faculty is common to our species and to brutes, I might have treated of it in connexion with the other qualities and faculties, which are common to us with them ; but I have preferred to follow the same order, which nature herself has established, in the arrangement of the organs of man, the principal object of my researches. In this manner I shall hardly be liable to commit errors ; whereas any division I might make of the qualities and faculties into determinate classes, might be subject to many modifications.

### *History of the Discovery.*

One of my friends used often to say to me, as you are engaged in the researches of the external marks which indicate the qualities and faculties, you ought to examine the head of my servant Joseph. It is impossible to find goodness in a higher degree, than in this boy. For more than ten years that he has been in my service, I have seen nothing in him but benevolence and gentleness. This is astonishing in a man who, without any education, has grown up in the midst of an ill-bred rabble of servants. Though at this period I was very far from placing what is called a good heart in the brain, and consequently from seeking a mark of it in the head, the repeated solicitations of my friend at length awakened my curiosity.

I recalled to myself the constant conduct of a young

man, whom I had known from his tenderest childhood, and who distinguished himself from his numerous brothers and sisters, by the goodness of his heart. Though he passionately loved the sports of his age, and his greatest pleasure was to scour the forests in pursuit of birds' nests, as soon as one of his brothers or sisters was sick, a more irresistible inclination kept him at home, and he bestowed on the patient the most assiduous attentions. When there were distributed to the children grapes, apples, cherries, he had always the smallest part, and rejoiced to see the others better provided for than himself. He was never better pleased, than when any thing agreeable happened to those he loved ; in this case he often shed tears of joy. He took care of sheep, dogs, rabbits, pigeons, birds ; and when one of his birds died, he wept bitterly ; which never failed to draw on him the ridicule of his companions. And even now, benevolence and goodness are the distinctive character of this individual.

His character has certainly not taken this turn from education. On the contrary, others, in regard to him, have pursued a conduct, which should have produced an opposite effect. I began to suspect therefore, that what is called a good heart, is not an acquired quality, but innate.

At the same time I spoke of the goodness of heart so highly extolled, of the domestic Joseph in a numerous family. "Ah !" interrupted the eldest daughter, "our brother Charles is precisely the same ; you must really examine his head. I cannot tell you how good a boy he is," &c.

I had therefore in sight three subjects, whose goodness of character was well acknowledged. I took casts of all three : I put their busts side by side, and examined them till I had found the character common to these three heads, otherwise very differently formed. In the interval, I had applied myself to find similar subjects in schools, families, &c., in order to be prepared to multiply and rectify my observations. I also



extended these observations to animals, and I collected in a short time so great a number of facts, that there is no quality or fundamental faculty and organ, whose existence is better established than that of goodness, and the organ on which it depends.

*Natural History of Goodness, Sensibility, Benevolence in Man.*

Is man born good or wicked? This question, so often agitated by philosophers and moralists, has necessarily remained undecided till this moment, because the true sources of our propensities, the different motives of our actions, have remained unknown. The study of organization, and of its influence on the exercise of our innate dispositions, has been neglected; hence the vagueness and arbitrariness, which prevail in all discussions on the true character of the human race. Some are struck only by examples of wickedness, malice, persecution, oppression, injustice, vengeance, treason, infidelity, perjury, envy, ingratitude, calumny, imposture, selfishness, &c. Others are touched with traits of goodness, benevolence, justice, generosity, gratitude, pity, compassion, disinterestedness, generous pardon, resignation, &c. The former quote in support of their opinion the characters of Tiberius, Nero, Commodus, &c., &c. The latter boast of Marcus Aurelius, Antoninus Pius, Henry IV., &c., &c. Thus the detractors of our species are as well sustained in saying, that man is born wicked, as the partisans of the other opinion in maintaining, that he is born good. But, on either side, there is the mistake of embracing the one or the other of those opinions exclusively. Let us examine man under the double relation of his proneness to good and to evil.

The Creator has destined men to live in Society. It was therefore necessary to bind them strongly by the principle of sympathy. They had to share their pleas-

ures and their pains, and often to suffer more from the misfortunes of others than from their own. In this, Providence manifests itself in a striking manner. If the sufferings of our fellow-men excited aversion in us, the first thing we should do at the sight of an unfortunate or suffering man, would be to banish him from us, instead of running to his relief. This sympathy, this sentiment of benevolence, therefore, is the cement of human society, of public happiness.

We shall hardly find a family, however small, in which there are not some individuals distinguished by their good heart, by sensibility, by a benevolence resembling that, of which I have quoted some examples, in the history of the discovery of the external sign of this excellent quality: while other individuals shall give evidence of a disgusting insensibility, of selfishness, love of mischief, and sometimes even of a propensity to cruelty.

Every day I meet the sad spectacle of animals inhumanly treated; it may be a poor sheep struck with repeated blows, while dragging him to slaughter; it may be an unhappy horse, sinking under his load, while his pitiless driver mangles him with the lash, after having unmercifully overloaded him. But I am not the only one, whose heart bleeds at this inhuman treatment. Young and old, men and women, strangers and inhabitants, burst out with indignation against this cruelty. There is no one, who has not formed the wish, that the animals were taken under the protection of public benevolence. If, sometimes, the great find pleasure in putting at bay an unhappy stag, at least there is no flatterer so vile, as to have counted these remains of ancient barbarity, in the number of royal virtues.

Man is naturally rather good, just, and benevolent than wicked and unjust, especially when he is calm and not impelled by passion in a different direction. Men of simple manners, the easy peasants, the great mass of the people, industrious artisans, are very benev-

olent towards their fellow-creatures. We rarely see among them an orphan, who fails to find all the succour which his situation requires; and their custom is to treat him as their own children, often, even with more tenderness. Rarely does the poor man, who has knocked at their door, retire with his hand empty; in fine, the direct impulse is always that of benevolence for the unhappy.

Children are accused of cruelty, because they amuse themselves with tormenting animals, which insensible persons sacrifice to their wantonness; but they have no idea of the sufferings they cause to a bird, to an insect, because the signs of pain, in these beings, are neither sensible enough, nor sufficiently analogous to our own, for the commiseration of children to be excited by them. If they are playing with a dog, and he utters a cry of pain, their natural pity is almost always awakened. It is rare to see them resist this feeling.

The populace runs with eagerness to executions; they seek with ardor the spectacle of these bloody sacrifices. Perhaps we ought, in this case, rather to accuse them of coarseness than of barbarity. Abundant tears always attest the compassion of the greater number of spectators. The horror, which the criminal inspires, is often annihilated, to give place to pity alone. In this I perceive another secret motive; every power demands to be exercised. It is especially the sentiment of benevolence, which experiences this necessity. All tragic scenes attract a crowd of spectators; every one loves to stop, to become penetrated with pity, to identify himself with the sufferings of others. There are but a small number of beings so ill organized, as to enjoy the sufferings inflicted on their fellow-men.

Several moralists have already given, as an evidence of the benevolence of mankind, the universal tenderness with which men are seized at tragic spectacles, when a well managed representation gives a probabil-

ity to the events, which are exhibited. It is easy to observe all that is added to an impression generally felt, by the communication of feelings; and the rapidity, with which the emotion is propagated, does not allow us to suppose, that it is owing to any reference to one's self. In romances, when the situations are introduced in a natural manner, when a happy tissue of probable events has so attached us, that the fabulous has disappeared from our eyes, the personages interest us, and we share all the emotions by which they are themselves agitated. It results from this, that it is sufficient to make men forget their private interests, in order to restore them to nature, and consequently to pity. Here again is felt the necessity of exercising benevolence. In ordinary life, we rarely meet scenes so interesting, so sad, so touching, as tragedies and romances represent them. It is this same necessity, and not that of being moved in general, nor that of being occupied, nor is it always curiosity, which leads men to seek events calculated to excite compassion, and to take the part of an unhappy man; to interest themselves for those who are a prey to persecutions and all sorts of dangers: it is this same necessity of exercising the feeling of benevolence, which finally lends a peculiar charm to all great misfortunes, to all disastrous events.

A superficial glance on what ordinarily passes in life, might lead us to believe, that the care of subsistence, and interest in general, is the principal motive of human actions. In many persons it prevails, in fact, to the extent of not suffering the concurrence of any other object of attention or desire. But, if interest were an exclusive motive, an injustice which impairs our fortune, or a benefit which augments it, would produce in us the same emotions, as a torrent which lays waste our possessions, or a rain which fertilizes them. We should consider, in our fellow-men, only their influence on our interests. Now observe men, when they see others a prey to misfortune and



to suffering. We daily observe men precipitate themselves into water or rush amid flames, to save those who are threatened with destruction. Hardly have public calamities, such as conflagrations and floods, ravaged the property of our fellow-men, when every body is eager to repair their losses: we make collections, and give spectacles and concerts for the relief of the unfortunate. Those, whose means are too limited, often have a painful contest to sustain, between this want of power and the natural impulse, which leads them to do good. The child, that utters cries of pity when he sees his brother attacked with convulsions; the man who abstains from asking an office, when he learns, that his friend, burthened with a numerous family, makes the same request; the soldier, who presents himself to receive the fatal blow, which would have reached his commander; Saint Vincent de Paul, who had himself chained among the crew of galley-slaves, in order to restore an unhappy criminal to his wife and children, plunged in the most extreme misery, &c.; such beings, assuredly, cannot be suspected of having acted from selfish feelings, from a regard to personal interest.

Is there any one, who is not touched even to tears, when he learns, that measures have been taken to relieve indigence and misery? When he sees the innocent acquitted, pardon granted to an accused man more unfortunate than criminal, or the sick restored when apparently about to sink under the weight of disease? Are the saloons ever better filled, than when they give spectacles and concerts for the benefit of the unfortunate? And in those moments, when we ourselves are a prey to affliction, is there any thing which more calms and animates our hearts, than the recollection of the good we have done, and the compassion, with which we see others moved in our favor?

The pleasures derived from benevolence, are as personal to us, as those, which come from any other

desire whatever ; and the exercise of this sentiment is one of the principal sources of our enjoyments. Every act of goodness or attention from parents to their children ; every heartfelt emotion towards our friends or any other individual, are true pleasures. When we experience this tender sympathy, we cannot avoid approving ourselves ; we rejoice in being so constituted ; and this sentiment becomes an inexhaustible source of satisfaction. Pity and compassion themselves, regret and sadness, when they arise from sensibility, participate in the nature of the emotion which has given them birth ; if they are not positively pleasures, they are at least sweet and noble pains, which one would willingly undergo for the satisfaction of aiding those, who are the objects of them. In this class of affections, even excesses in liberality and generosity, never draw after them those regrets, that remorse, which accompany hatred, envy, avarice, and wickedness.

When benevolence is threatened with becoming enfeebled towards those, who are neither our parents, neighbours, nor acquaintances, it deludes itself, and is converted into zeal for the public good, and enthusiasm for humanity. All the inhabitants of the world are then worthy objects of its attention and its exercise.

The simple recital of events, which happened in distant ages and countries, produces in us admiration, pity, or indignation. Benevolence makes an interesting spectacle of human life, and persuades without ceasing even the most indolent, to take one side or the other in the scenes, which have passed among our ancestors. It sheds pleasure on the present life, on domestic life, on all which surrounds us ; and by the expression it gives to the physiognomy, it surpasses the charms of beauty ; it is from this that the situations of life, derive what they possess most touching. The price of a favor has no longer any bounds, when it bears the impress of the goodness of the soul ; and the misfortune, which is not the result of ill conduct,

is supported with resignation. By a spontaneous emotion, we grant our friendship to those, in whom we think we discover the marks of goodness. Even the hero, who sheds his blood for his country, appears to us to deserve our love and admiration, only so far as he is benevolent, compassionate, generous. Can one pronounce the names of Bayard, Duguesclin, Turenne, Scipio, &c., without experiencing that virtuous emotion, which awakens the idea of true goodness?

Benevolence extends even to posterity. The philanthropist sacrifices his personal well being to his heirs, to those who will see the day long after him. It is for them that he plants trees, that he bequeaths legacies to beneficent institutions. It is for them, that he labors day and night, that he braves insults, calumnies, persecutions, because he knows, that a time must come, when his works will be blessed for their beneficent influence on humanity. Without this sentiment of general benevolence, how many facts, how many useful discoveries would be buried under the weight of the envy, the jealousy, the bad faith, and the ingratitude of contemporaries!

In all ages, the pardoning of evil doers and enemies has been commanded by the most elevated morality. Man, endowed with an energetic sentiment of benevolence, is naturally disposed to that noble and virtuous resignation, to that self-denial, which to every one else appears so painful, that we regard such acts of generous pardon, especially when it goes so far as to return good for evil, as the most admirable and most sublime efforts of human nature. The sensitive man, when he is injured, experiences a primary emotion of resentment, of vengeance. No one is so secure from self-love, that he cannot sometimes be surprised into unworthy emotions. But hardly has the benevolent man returned to himself, when every project of vengeance disappears, as contrary to moral greatness; he pardons, and contents himself with pitying and despising the intrigues of baseness and malice.

The wicked man, on the contrary, charges the benevolent and generous with weakness; he boasts of that force of character which, to judge by what he says, is necessary to put in execution his vindictive conceptions. I shall call that man, so inclined to vengeance, *strong*, when he has learned how to conquer himself, and to renounce that satisfaction so sweet in his eyes, of rendering evil for evil. Was Marcus Aurelius weak, when he refused to see the head of the rebel Cassius; when he burned his letters, in order not to be obliged to punish those, who had been concerned in revolt, and pardoned all the cities which had embraced the same party? When Titus condemned all accusers by profession, to be scourged and sold as slaves; when he pardoned his brother Domitian, and loaded with favors two senators who had conspired against him, were these acts of weakness? Has Antoninus ever been judged weak, because he despised and banished informers; because he restored to Rome, by his goodness, a repose of which his predecessors had deprived her by their ill-conduct? Was Henry IV. weak, when he pardoned all the leaguers; when he answered to one who spoke to him of an officer of the League by whom he was not beloved, "I will do him so much good, that I will force him to love me, in spite of himself?" When he replied to those, who exhorted him to treat with rigor some places of the League, "The satisfaction, we derive from vengeance, endures only for a moment; that, which we draw from clemency, is eternal?" The modest and generous Turenne, when he contented himself with banishing from the army a wretch, who had come into his camp with the design of poisoning him, can he be accused of weakness? The élite of great men rise in mass to refute this paradox, invented and approved by the despicable genius of vengeance.

In fine, let us place benevolence on the throne; shortly it will be nothing but strict necessity, that will dictate imposts; the cities and villages afflicted by



calamities will be consoled ; the patrimony of the prince will be consumed in acts of beneficence, as if he had renounced the right of property ; acts of rigor will be reserved for the incorrigible offender ; the love and happiness of the people, will be the principal end of government ; informers will be despised and banished ; conspiracies will be strangled in their birth, before they have time to draw in the imprudent to their ruin ; war, almost always a public pest, will be avoided, and the life of a good citizen, preferred to the death of a thousand enemies ; man, being attached to nothing so strongly as to the worship, which he has been taught from infancy to believe, the most acceptable to his Creator, there will be not only tolerance, but entire liberty of conscience. Credulity, superstition, error, imposture, charlatanism, slavery, chicanery, the seizure of the goods of orphans and wards, will be the only objects of reform and persecution. To soften brutal passions, and to dispose the people to honest enjoyments, moral, religious, and civil instruction will be imperative on all classes ; even the malefactor will be judged worthy of compassion. Every where we shall see the institutions of benevolence multiplied ; hospitals for the sick, for the insane, for the deaf and dumb, the blind, the incurable, old men, invalids, &c. The brothers and sisters of mercy will have the first claim to public esteem. We shall see asylums formed for lying-in women, for foundlings and orphans. Every where schools, academies, universities, museums, libraries will foster the arts, sciences, &c., for the purpose of increasing the happiness and ennobling the enjoyments of men.

Such are the precious results of goodness, benevolence, sensibility. Who then will dare to doubt, that this beautiful quality is inherent in human nature ? Henceforth am I not right, when according to the example of Marcus Aurelius, I build to it a temple in the most perfect organization which exists on the earth ? But is this the primitive fundamental

quality? Is not benevolence, as I have thus far represented it, rather the energetic action of another quality, which would be the primitive destination, and to which the organ in an ordinary development would be devoted, as happens with self-defence, the voracious propensity, and the sense of property?

*Moral Sense, Sentiment of Justice and Injustice.*

The reader will remember, that I have been able to determine the organs only in their extraordinary development, which has for its result a very energetic disposition. This disposition, when it becomes active, sometimes puts on a character, in appearance altogether different from its ordinary manifestation. The propensity to libertinage results from the undue development of the organ of propagation; and a too great activity of the sentiment of property, induces the propensity to theft.

It is the same with benevolence. The individuals, who had become remarkable by peculiar goodness and benevolence, offered also a very great development of the cerebral part indicated in the historical sketch. Consequently, goodness, benevolence, sensibility, are not the primitive destination or ordinary function of this organ, but the manifestation of its exalted function. Is benevolence, then, something more than the primitive function of the organ from which it emanates? What is this primitive function?

It being too difficult to make positive observations on the fundamental original destination of an organ, I am under the necessity of resorting to reasoning. I think I have reasons sufficiently plausible to establish, that the primitive destination of this organ is, to dispose man to conduct himself in a manner conformed to the maintenance of social order. I call this disposition the moral sense, the sentiment of justice and injustice. Let us first make some reflections on the ex-

istence of this sentiment, and on the difference, which is thought to exist between it and benevolence, and we shall then be led to the conclusion, that this last is only a more elevated degree of action of the moral sense.

Since man was destined to live in society, the moral sense has become indispensable to him. Without it no association, no family, no union, no nation could exist. If there is no obligation imposed on me towards you, you will acknowledge none towards me. We shall be obliged to isolate ourselves from each other; without reciprocal duty there can be no mutual assistance. Each one will set up as master; our relation will be that of the beasts of prey; eternal war will be our destiny. Now, since men have formed societies in all ages and in all countries, it follows necessarily that each one is convinced, that in his individual capacity, he is only a part of the whole, which demands all his regard; that nature has imposed on each a tacit condition of contributing to the public good; that is, that all men are endowed with a moral sense, with a sentiment of what is permitted, of what is duty, and of what is forbidden.

“The Author of Nature, in endowing man with free will has obviously destined him to be a moral agent; we have such need of morality, that the sentiment of justice and injustice ought to commence with our being, and precede the exercise of reason.”

M. Laromiguiere maintains his position by an observation of Rousseau, who says:—

“I shall never forget having seen a young child struck by his nurse. He was immediately silent. I thought him intimidated; I was mistaken. The unhappy boy was suffocating with anger; he had lost his breath; I saw him turn purple. A moment after came shrill outcries. All the signs of the rage, of the resentment, of the despair belonging to his age were in his accents. If I had doubted, that the sense of justice and injustice were innate in the heart of man, this example alone would have convinced me. I am sure, that

a burning coal, dropped by chance on the hand of this child, would have been less sensibly felt than this blow, so light, but given with the manifest intention of offending him." (Emile, B. I.)

"There is no one," continues M. Laromiguière, "who has not had an opportunity of making the same observation as Rousseau, and who has not adopted the same conclusion, which he draws from it."

Rousseau draws the inference, that the sense of justice and injustice, is innate. M. Laromiguière adopts this conclusion. "I will nevertheless," says he, "hazard one remark on the expression *innate sentiment*. Strictly, the sentiment of justice is not innate. There is in the soul something which precedes it, be it only for a moment. I place the period, at which this sentiment manifests itself, immediately after birth. The child must attribute a will to the external agent, but nothing is more natural to him, nothing more ready; since he hardly exists, before he perceives himself endowed with a will."

Does the moral sense then judge only of the actions of others, and are the faculties and propensities innate only for the reason, that their exercise supposes a will?

The object of the moral sense is not always so determinate, as that of benevolence. Its province is confined to generalities; to abstain from doing ill to others; to be just towards every body; to do one's duty; this is what the moral sense includes.

But the ideas of men upon what is good or evil, upon what is just or unjust, upon what is duty or not duty, are in many respects very different, often contradictory among individuals and among nations. It has been attempted to define all actions conformable to human nature as being *good*. Bad actions are those which are conformable to the will of one who is governed by evil propensities. Even if we acknowledge as good, those actions only which accord with public expediency, it will still be extremely difficult to apply this principle to particular actions. The estimate of actions varies,



according as the degree of ignorance or knowledge, the different interests, habits, and customs of a nation change. How often have public morals and legislation been clothed with forms altogether different? This diversity not only marks the opinions and actions, which concern the different religious and political sects, but bears also on things which appear to interest morals exclusively. Theft, polygamy, polytheism, incest, adultery, suicide, and even parricide, have been regarded in turn either as crimes, or as acts permitted, and even meritorious.

In Italy and Spain, freemasonry is condemned as a criminal association. In Austria, it is regarded as dangerous to the government. In France, and the north of Germany, men boast of belonging to it, and it does no harm whatever, &c.

It is only when it is agreed, that such a thing is good or bad, just or unjust, &c., that the moral sense becomes the regulator of our actions. The command, to do well and to avoid evil, has been given to all men. All have the innate sentiment of this duty, and all agree in it. And accordingly, the moral sense is not the principle of a determinate act, but the principle of duty, in general.

Philosophers, who have neglected this essential distinction, have thought they could deny the existence of the innate moral sense, and have regarded this as the artificial growth of society. But in this they have committed the same error, that they would do in denying the existence of hunger, because this want can be satisfied by a thousand different aliments.

Perhaps I shall make the properties of the moral sense more evident by putting it in comparison with benevolence. This parallel will serve, at the same time, to show the analogy between these two sentiments. To abstain from doing evil, to do one's duty, is the law of the moral sense, and of justice. To diffuse happiness is the law of charity and benevolence.

Amidst the instability of the opinions and judgments of men, there are an infinity of things, which are gen-

erally acknowledged as just or unjust, and which, even before the origin of laws, impress on morality a uniform and immutable character. The just man has a detestation of oppression exercised on his fellow-men ; of lying, perfidy, perjury, treason, informing, spying, hypocrisy, intolerance, calumny, cabal, usury, seduction, debauchery of every kind, counterfeiting, and all other thefts, cruelty, murder, &c. ; in one word, for whatever wounds the order and peace of society. The just man feels himself obliged to observe even arbitrary laws, to obey his parents and superiors, to fulfil his promises and engagements, to pay his debts, to repair a wrong done to another, to restore a deposit which has been confided to him, to reveal no secret, to give no pernicious counsel, to maintain good faith and equity towards every body. He respects all property, not only moveable and immoveable property, but also those of talent and of mind ; rights and privileges are equal for all men. Every law, which is not of urgent necessity, in his eyes, is an injustice, because it multiplies the cases of misdemeanours and crimes ; he rejects violent means for forcing from accused persons uncertain confessions, &c.

Thus the moral sense is confined to things of the first importance, without which, the idea of society would be only a chimera ; to things which man is not free to do or not to do ; which are commanded him by the laws of nature, and the transgression of which involves culpability, and provokes the resentment of the social body. The moral sense is therefore the basis of all legislation and of the law of nations ; it precedes laws. " For, if good and evil did not exist before laws, if they differed not widely from each other, right has no foundation, no justice. Laws would be the fruit of blind caprice, they would be attempts against the liberty of man ; to submit to justice would be to submit to the yoke of a tyrant." \*

---

\* Anti-Lucretius, Vol. I, p. 179.

The object of benevolence, though less necessary, is of a more elevated nature. The just man does only his duty; his acts are not meritorious; he is not the object of love and admiration. The benevolent man forgets himself; he sacrifices his personal well-being to that of his neighbour, friend, wife, his children, his country, the human race. He exercises acts of humanity, of beneficence, generosity, heroism, magnanimity. These acts, without being the attributes of duty, are, nevertheless, more beautiful, meritorious, and virtuous than those of the just man. The omission of acts of benevolence is not always considered as a crime; their fulfilment, on the contrary, is always an object of approbation and reward. Even savages never speak of acts of benevolence and generosity with the impression of duty. To do an act of kindness is to satisfy a natural desire, an innate sentiment. It is admitted among men, that the marks of benevolence and affection are the touchstone of what is meritorious, and the rule by which we appreciate actions, is taken from the influence they exert on the general good.

In acts of pure duty, man is moved by no lively or exalted sentiment. This is the reason why, frequently, men, forgetting their duty and the most ordinary acts of justice, give evidence of the noblest benevolence, when unfortunate events have awakened their sensibility.

For the same reason, the misfortunes which interrupt the habitual happiness of certain men, become salutary to them and to others; reverses awaken them from lethargy, teach them the sufferings of others, and dispose them to acts of sympathy and compassion. We need to have been sick, to appreciate the delight, inspired by those who come to console us.

When benevolence gives too much latitude to wickedness, and this grows bold through indulgence, the sentiment of justice resumes its rights. It is not just, that goodness should become the sport of envy, malig-

nity, and ingratitude. Experience has too often proved, that the wicked man is rarely touched by a generous act of pardon. It is just and necessary, that he be confounded, that his projects be defeated ; that vice and crime be repressed and punished. As the wicked man is ever inclined to malicious constructions, and as he sets down to the account of weakness or insensibility that, which goodness has led him to experience, justice makes it a duty to repel his attacks with vigor, and to convince him of his own impotence by the force and superiority of an exact retribution.

Such are the shades of distinction between the moral sense and benevolence. But is it not essential always to avoid evil and to do good ? Do we not see, that the difference is in the degree only, and that it must be permitted to presume, that goodness or benevolence is only a gradation of the moral sense, which is itself the primitive destination, the fundamental quality of the organ of goodness ?

Further, I have remarked with pleasure, that all authors, who have treated of benevolence, as of a quality inherent in human nature, constantly confound acts of pure duty and justice with acts of benevolence ; all regard this last as the source of all morality and all virtue. Let us examine the precepts of morality and moral actions, and we shall see, that beneficence constitutes an essential part of their nature.

If we consult history, she tells us, that the most moral and the most virtuous persons, have always been, at the same time, remarkable for their great benevolence. " Virtue alone equals men to gods ; to need little one's self, and to do to others all possible good ; to be severe towards one's self, and indulgent towards others ; to bear with men such as they are, because we cannot make them such as we would have them." Such are some of the maxims of Marcus Aurelius, the author of the Gospel of the Pagans, of the most beautiful moral system of antiquity. Who does not know the goodness and the moral char-



acter of Socrates? Trajan, when reproached with being too good, replied: "I wish to do what I would have an emperor do toward me, if I were a private man." The benevolent Scipio, though passionately fond of women, honorably sent back the wife of Mardonius to her relations, and restored to Allutius his betrothed, whose charms he could not withstand. Bayard and Turenne, did they not also restore to their fathers, husbands, lovers, the most beautiful women, who had been brought to them as the reward of their valor? And L'Hôpital, Franklin, and Vincent de Paul, how many institutions of beneficence and acts of generosity attest their extreme goodness! In fine, the maxim, Do to others as you would that others should do unto you, did it not emanate from the founder of the most sublime moral system, from the source and fulfilment of all benevolence? This principle, founded on sympathy, on reciprocal regard, is the most conformable to our nature, the best felt, the most easy to interpret, and includes in a few words all human morality.

It is proved, then, that there exists the most intimate analogy between the moral sense and goodness, and that it is impossible to separate acts of benevolence from moral acts. Consequently, I am justified in deriving goodness, sensibility, benevolence, from an energetic action of the moral sense, and in admitting for these two modified sentiments only a single organ.

### *Of Conscience.*

That pain or pleasure, which we experience within ourselves, in consequence of an evil or good action, or an action which we esteem wicked or otherwise, is called conscience. It is asked, if this sentiment, this internal judge, is a fundamental quality, belonging to a peculiar organ, or if it is solely a modification of

another quality, of another organ? I shall examine the nature or the natural history of conscience. It will appear, according to my reflections, that conscience is only a modification, an affection of the moral sense, of the sentiment of justice and injustice, of benevolence; as an agreeable or painful sensation is nothing but an affection, a modification of the organs of perception, in general.

Our judgment, whether such an action is good or bad, is determined according to two data of a very different nature. Either it is our natural disposition, or, it is the ideas received by the influence of external things, which make us judge a thing, an action, as permitted or forbidden, as good or as bad. In the first case, it is *natural conscience*; in the second, *artificial conscience*. This distinction will give us the facility of speaking pertinently and with truth, of a sentiment which, in the eyes of certain moralists, is a sure guide of our actions, and, in the eyes of others, is only a fruitful source of errors.

Let us first examine the natural conscience in all its shades, according as it is the product of different dispositions or of their different degree.

The natural conscience is always proportioned to the degree of the moral sense and of the sentiments of benevolence, with which an individual is endowed. Very benevolent and very sensitive persons have also a very delicate conscience. Scruples, repentance, and often the most keen remorse, pursue them after the most innocent action, provided they have induced consequences painful to their extreme benevolence. My father and mother, before they knew of inoculation, had witnessed the death of one of their children by small pox. Oftentimes I have found them bathed in tears, and examining with the tenderest inquietude, whether they could have any thing with which to reproach themselves. Yet there do not exist any parents who fulfil their duties with more exactness. I shall never forget the despair of a father

whom I had advised to inoculate his eldest son. Imbued with principles of metaphysics, he judged inoculation contrary to Divine Providence. A short time after, he lost this beloved child, a victim of this terrible pestilence. I fear that this father can never escape the remorse of conscience. His refusal of the benefit of the art, however, was founded on a pure and religious motive. — We are the innocent cause of a walk, which by accident proves fatal to a beloved friend ; and then we reproach ourselves always, as if we had been the cause of misfortune to a friend. A physician loses his patient, after having made every physical and moral effort. Is it possible, perhaps, he will say, that I could have deceived myself? Perhaps if I had not done such a thing, if I had acted in such a manner, the patient would not have died. More than once I have succeeded in regaining my tranquillity of mind, only by opening the body of the deceased, that final test of our knowledge and of our errors.

How much more poignant will remorse be, when persons, still endowed with energetic moral sense, and great benevolence, allow themselves to be led into actions, in themselves bad or criminal. No sooner will they have regained the entire use of their habitually predominant characters, than the opposition, the contradiction between the action committed and their natural disposition, will make itself strongly felt, and the deepest remorse will seize their minds. Let a tender mother, abandoned by her lover and disgraced in the eyes of the world, in an instant of wildness and despair, lay a trembling hand on her first born, and deprive it of life ; when the fatal concurrence of circumstances, and the frightful internal emotions have passed away, the innate sentiment of maternal love, the sentiment of horror at her act will revive. A terrible combat will arise between her natural disposition and her crime ; the murder of her infant will always be present to her eyes, and will poison her existence. A good and honest man, in a violent paroxysm of anger,

had killed his wife ; he was condemned to perpetual confinement. He would have preferred death a thousand times, because he felt, that for the rest of his days he should have his mind torn by the most terrible remorse.

What happens suddenly in these cases, fails not to happen sooner or later to those, who, being good and benevolent, are governed at the same time by bad propensities. It is these men, who do not always the good they would do, and who often do the mischief they would not do ; it is an evil propensity which controls them ; when they wish to do well, they experience another power which opposes it. There results from this a confusion of character and an alternation of action, which appears inexplicable to those, who are not familiar with the internal and often contradictory motives of our actions. The best men are sometimes a prey to the most deplorable vices, to the most shameful debauchery, to theft, &c. Did not Trajan and Adrian, both, dishonor themselves by irregular passions, in particular cases ? To-day they walk in the high road of sinners ; to-morrow they hide themselves in a corner among penitents ; and it is thus, that the life of such is passed between vice and remorse, according as they consent to follow, sometimes this impulse and sometimes the other. When, in fine, they are worn out by irregular indulgences, or the illicit desires become appeased, they experience a salutary return to themselves ; they sincerely disapprove their past life, and repair the evil and the scandal by a conduct, the more exemplary, as their sense of justice and benevolence inspires them more thoroughly.

When the moral sense is not warmed and enlightened by the gentle flame of benevolence, it should no longer be trusted. It gives itself up to the errors of reasoning, to the instigations of self-love and egotism.

Examples and customs lead it astray and serve it for rules, rather than the true notions of good and evil.



The symptoms of indifference, and of the change of the sentiment of justice and injustice, every where manifest themselves. Men do, they see done, and imitate, without regret or remorse, things evidently immoral. They no longer distinguish between good and evil, except as the law expressly commands or forbids. The laws are evaded; good faith is betrayed in transactions, provided they can adroitly escape the resentment of justice. In the intercourse with traders, artisans, agriculturists, &c., the beautiful words, "do to others as you would, that they should do to you," are considered antiquated notions; the confiding man is always the dupe of fraud, without any one pitying him, without any one blaming the deceiver; in the slightest undertaking it is necessary to envelope one's self with a thousand formalities; a rich harvest for chicanery and every kind of artifice; epigrams, scandalous reports, the retailers of calumny and malice, are the favorite objects of the public; to attack and blacken merit, and to take from it the means of defending itself, is one of the maxims in vogue; seduction of innocence is a sport; conjugal fidelity is out of fashion; mothers trust their children to mercenary hands, without any other reason, than that of following the torrent of fashion, and to free themselves from the too painful cares of education: children are ambitious to free themselves from the power of their parents. Thus much for the proofs of the enfeebling of the moral sense, by the spirit of the age!

Let us, finally, follow man, organized unhappily enough to be wholly a stranger to the sentiment of benevolence, and of justice and injustice, and who is, moreover, powerfully disposed to give himself up to acts opposed to duty and the public good. Rarely will such an individual find his judge in himself. The preverse inclinations are predominant; they compose his character; consequently, evil actions are in harmony with him, and rarely is the contentment of his mind ruffled by them. This view of depraved man will

perhaps displease those, who dream only of the dignity of the human race. But look at the usurer, the libertine, the villain, and you will see, that each of them finds himself happy, only in proportion as he satisfies his desires. I have made from my youth the sad and alarming observation, that the most perverse men take pride in their talents for deceiving and abusing, and that they always dwell with a feeling of delight, on the striking incidents of their criminal life. Go into the prisons, place yourself in the midst of their inmates, avoid the appearance of a person in office, in order not to be deceived by a feigned repentance, and inspire those men with confidence and frankness ; with what internal satisfaction, with what vanity and joy in having done evil, will the great criminals recount to you, without forgetting the most insignificant details, both their crimes and the particular manner in which they committed them ! If perchance one of them takes the trouble to speak of them with a pretended horror, he allows to escape him a malignant smile, which shows his hypocrisy. The greater part exert themselves to utter the gayest pleasantries on the most atrocious acts, and frequently at the moment they see you shudder with horror, they burst into a laugh. Count in the prisons all those who have been committed a second time, and you will see how few have repented.

Finally, examine the great criminals in judicial proceedings ; follow them to the scaffold ; with what obstinacy do some deny the most evident facts ! with what surprising audacity do they insult the witnesses who accuse them ! with what bare-faced effrontery, and what scrupulous exactness do others recount a series of frightful crimes. A soldier had committed robberies in twenty churches ; he was led to the gallows where he expected to receive pardon ; but in place of showing any repentance, he said to confessor Wiedemann, at Vienna : " I see clearly that there is no more to do here, I will try to go elsewhere." At Vienna a certain Z. assassinated his mistress with a

knife, in order to rob her of three hundred florins ; he cuts up the body to hide it more conveniently in a box ; then he goes to a ball, there passes the night, spends all his money, and gives himself up to all the excesses of grovelling enjoyments. M. Bruggmanns, at Leyden, showed us the cranium of the chief of a band of Dutch robbers. This man had thrown several persons into canals, merely to see them struggle for life. What can they do to me, he said, in his trial, am I not an honest man ? Schinderhannes, and Hekermann, his accomplice, had extreme pleasure in recounting their crimes ; their eyes sparkled during their recitals. All the accessory circumstances, which were calculated to place them in a striking light, caused them the most lively joy. A daughter, who had aided her mother to kill her father, never testified the slightest repentance. When spoken to about her crime, she shrugged her shoulders and smiled. Rossignol boasted of his barbarity. " Look at this arm," said he, " well ; it has butchered sixty-three priests at the *Carmes de Paris* !" Having escaped several times from prison, he commenced and redoubled his robberies and cruelties, and the most disgusting debaucheries. There are some of these wretches executed, who, at the moment of their execution, in calling to mind all the enjoyments in which they had indulged during life, have boasted, that none equalled those which cruelty had caused them. About fifty years since a man, guilty of several murders, was broken upon the wheel at Lyons. After having his limbs broken on the wheel, he laughed immoderately. The executioner having asked the cause, he answered that he could not help it, thinking of the contortions which that tin-founder made, when he had poured the melted tin into his throat. Gabrino Fundulo, famous for his perfidies and cruelties, being condemned to be beheaded, said boldly to the confessor, who in vain urged him to repent of his crimes, that there was only one subject of regret he had in dying ; it was, that he had not

hurled from the top of the tower of Cremona, Pope John XXIII., and the emperor Sigismund, when they had the curiosity to mount it with him. Read the biography of the tyrants, who have desolated the earth, and see if one among them has renounced his crimes, before public vengeance or death has cut him off from society.

The physiological study of great villains proves, therefore, that they are inaccessible to repentance or remorse. Why, said Cardinal Polignac, should vicious men, for whom crime has attractions, and who do not think themselves criminal, why should they repent?

To conclude our analysis, it is certain, that, in many cases, the moral sense does not enlighten us in relation to the morality or the immorality of an action; that it often deceives us in regard to the objects, on which it ought to be exercised; that, active in all its energy, or graduated to goodness, benevolence, sensibility, it often exaggerates to us an evil which does not even exist, and disturbs the tranquillity of our soul by trifling scruples and unmerited remorse; that, in individuals in whom this organ has received only a feeble development, and in whom, on the other hand, the evil propensities are predominant, it is silent, remains dead, does not produce even a shadow of its existence. What lesson must the moralist, the instructor, the legislator, necessarily draw from these observations? It follows, that it is necessary to dissipate the illusions of the too exalted moral sense, to rectify its wanderings, and to replace its absence by the creation of *an artificial conscience*, that is, that we must put in action all means to enlighten men, in relation to what is really good or bad, just or unjust, commanded or forbidden. It is here, that the maxim, "Ignorance is the source of all evil," finds its entire application. Man, instructed as to the influence of certain actions on his own interest and that of society, familiarized with the evil which menaces himself, and with that which he causes to his fellow-men, will no longer be the victim except



of just remorse ; and, when his propensities are opposed to the principles of a pure morality, he will find in these a sure guide, a regulator of his actions ; for there is no one who does not think himself bound to do good and to avoid evil, which constitute the sole end and principle of the moral sense inherent in our nature.

Must I again observe, that the artificial conscience becomes the more indispensable, as an individual is more disposed to do evil, and that it is against evil dispositions in particular, that all the efforts of moral instruction must be directed ?

It follows, from all that I have now said on conscience, that it can by no means be considered as a fundamental quality ; that it is really only an affection of the moral sense or of benevolence, and that, consequently, no particular organ can be assigned to it.

### *Seat and External Appearance of the Organ of Benevolence.*

We have taken a view of the organs, which are placed on the anterior inferior, and the anterior superior, part of the frontal bone. We now come to the organs which have their seat under the superior part of the frontal bone. This superior part of the frontal bone divides again, in its relation to organology, into its superior anterior, and its superior posterior part. These two parts are covered with hair, however imperfectly it may be.

Within each of these two halves, in the median line, meet corresponding cerebral parts of the two hemispheres, and these parts, when greatly developed, form a lengthened protuberance in the anterior part, and a similar protuberance in the posterior. If, on the contrary, the organs, placed under this region, are only very moderately developed, in place of rising, either in its anterior or its posterior half, it remains flattened to the summit of the head, where it meets the anterior superior edges of the two parietal bones. (Pl. LIV. fig. 2.)

Now I have found, that all persons eminent for their benevolence, all those who distinguish themselves by very great philanthropy, have the superior anterior middle part of the forehead, or the middle part of the superior anterior part of the frontal bone, projecting in a lengthened protuberance, and, consequently, that the cerebral part XIV. Pl. IX. XI. XII. is the organ whose energetic action constitutes goodness, benevolence, the gentle character.

Since the discovery of this organ, hardly a day has passed, that I have not discovered confirmations either positive or negative of this truth.

Sooner or later, and sometimes on the slightest occasions, we shall discover in persons, in whom these cerebral parts have acquired only a very feeble development, mischievousness, a malicious, vindictive, hard, and ungrateful character, and a spirit of detraction. Let it be admitted, that it is so because, in this case, there exists no organ whose activity holds the balance against that of the other organs, and that in this manner selfishness becomes predominant; or let it be conceded, that the feeble development of this cerebral part itself involves these malicious dispositions; still, it is certain, that persons thus organized, when motives of a high order do not come to their aid, will never be capable of lasting benevolence. What I have said above of negative qualities, is again applicable here. As the appetite may degenerate into a disgust for food, the inclination for physical love into antipathy for the sex, the sense of tones into aversion for music; so benevolence and goodness may degenerate into wickedness, by the indulgence of joy at the misfortunes of others.

Compare all the personages, ancient or modern, who have distinguished themselves either by their benevolent character or by cruelty and wickedness; and we shall find between them a marked difference in the superior anterior middle part of the frontal bone. I confine myself to the recital of a small number of examples.

Compare Tiberius, Caligula, Caracalla, Nero, Catherine de Medicis, the Nero of the north, Christian, the cruel, perjured, and perfidious; Danton, (Pl. *LXIX.* fig. 3.) Robespierre, fig. 4, with Trajan, Marcus Aurelius, Antoninus Pius, (Pl. *XCIII.* fig. 1;)\* St. Vincent de Paule, (Pl. *XCIII.* fig. 1;)+ Henry IV., L'Hôpital, Camille des Moulins, John Baptist Cloots, Madame de Geoffrin, Dupont de Nemours.‡ Observe in general, all philanthropists, all men of benevolent character, and who are drawn without thinking of it into beneficence, confidence, loyalty, cordiality; and compare these men with the wicked, the vindictive, the perfidious, with those who every where seek and meditate fraud, cabal, the ruin of others, &c., and you will soon be forced to confess, that benevolence is a fundamental quality, independent of all others, and that its organ is placed in the median line of the superior anterior part of the frontal bone.

All the crania of the Caribs, (Pl. *LXXIV.* fig. 1 and 2.) which I have seen, as well as the crania of a tribe of negroes of the Carib islands, which is remarkable for cruelty, are depressed in the organ alluded to.

---

\* Adrian said, "Of all men whom I know, I know that Antoninus is the one who least desires empire: but I know also, that he is the most worthy of it." Accordingly we find the upper part of the head very high, the organs of ambition and of pride, on the contrary, very little developed.

† St. Vincent de Paule, founder of the establishment for foundlings, of the sisters of charity for the service of the sick poor, and to whom the hospitals of Bicêtre, Saltpetrière, la Pitié; those of Marseilles for criminals, and of St. Nom de Jesus for old men, owe the greater part of what they now are.

‡ I quote a single passage of this benevolent naturalist and philosopher. In speaking of the window swallows, he says; "When one of the couple dies, it is rare that the other does not follow in a few days. The sweet prattling has ceased; there is no more chasing, no more laboring. A dull repose, a mournful silence are the signs of grief to which the survivor falls a victim."

I apprise young people of this, who, though otherwise good and amiable, amuse themselves in shooting at these birds, because they are hard to hit. My friends, shoot at nuts in the air, which are more difficult still to hit, and spare these amiable birds. Remember, that every shot which takes effect kills two swallows; the last by a protracted torture.

According as this organ coexists with other organs likewise much developed, there must result different modifications from these different combinations. The robber, endowed with benevolence, gives to the poor a part of the fruit of his robberies. It is thus, that St. Francis de Sales cheated at play, that he might aid the indigent. The voluptuous man divides his fortune with women who are deserted; the devout does good works for the love of God.

As this organ is common to man and brutes, we might ask, why, in man, it is not placed immediately in connexion with those organs which are common to him with the other animal species? Why is it placed in him above the organs of the intellectual faculties?

This exception in the arrangement of organs, may serve as a proof to the reader, that I have not let myself be carried away by reasoning, but that I have taken facts for my only guide. In reflecting on it, we find, that nature may have had very wise reasons for thus placing the organ of goodness. Perhaps nature proposed to herself a very high purpose in thus combining the action of the organs of goodness, of benevolence, of generosity, of love of one's neighbour, of the moral sense, with that of the organs of the intellectual faculties. The Author of all which exists, was not ignorant that the judgments and actions of man are much more determined by his feelings and inclinations than by his judgment. It is also apparently for a similar reason, that the organ of the moral sense, of the sentiment of justice and injustice, is immediately followed by the organ, which leads man to the adoration of the Supreme Being.



*Of the Action of the Organ of Benevolence in mania.*

This organ performs, more frequently than is supposed, its particular functions in mania, both in madmen, who gave themselves up to all sorts of malice and mischief, and in those, who wish to overwhelm every body with kindness.

A hussar, who had always manifested the greatest goodness of character, became insane. He no longer allowed the slightest clothing on himself, but gave away every thing. He said unceasingly, that he wished to make every body happy; and in all his projects of beneficence he mingled the holy trinity. His cranium proves, that he had the organ of goodness and that of devotion, both extremely developed.

When I proved the plurality of the organs of the brain, and the natural independence of the moral qualities and of the intellectual faculties, I quoted several cases in which, by the side of an alienation or a complete imbecility in regard to all the other faculties, certain propensities or talents manifested themselves with great energy, such as the venereal desire, cunning, the propensity to theft, the talent of imitation, extraordinary verbal memory, &c. Others overwhelm every body with demonstrations of regard and attachment; others, on the contrary, are real demons in wickedness and malice, and break and tear whatever falls into their hands, maltreat and torment men and animals, and take vengeance for the slightest reasons. M. Spurzheim quotes two such facts mentioned by M. Haslam. "W. H. V., a boy aged about seven years, was received into the hospital the 8th of June, 1799. The mother, who often came to see him, mentioned, that about a month before she was delivered of this child, she had a severe fright. Immediately after its birth, the child was subject to agitations, and the least indisposition caused it convulsions. At the age of one year it appeared

more lively, and slept less than the other children. When it was two years old, the mother perceived, that she could not control it even by frequent corrections.

“All its physical and intellectual qualities developed themselves slowly. At fifteen months the teeth had not yet protruded; at the age of two years and a half, he could not yet walk alone; at four years, he just began to speak. On entering the hospital, at the moment when he left his mother, he shed some tears, but his grief was of short duration. He was placed near the women; the novelty of his situation appeared to be agreeable to him; each object excited his curiosity, without fixing his attention; constantly in a turbulent agitation, he was ever traversing the apartments of the house. His manner of conducting with the other patients had something in it rude and insolent; sometimes he gave them kicks, sometimes he made a thousand grimaces or spit in their faces. As soon as the guard appeared, he ceased his pranks and promised to be more tranquil. In vain did they try several times to make him understand the importance of truth: he could never be made to confess the faults he had committed; he always avoided the trouble by some falsehood. In a very short time he gained great skill in the art of mimicry; he practised himself in mimicking the sick in their paroxysms of derangement, and particularly those who were shut up, because he could do it with impunity.

“In the space of three months he made progress in knowledge, but he borrowed his language from all those who swore or made use of obscene expressions. It was in vain, that they attempted several times to teach him the alphabet. The lessons displeased him continually, and nothing could stimulate him, whether they employed gentleness or made use of violence; he could not fix his attention long on the same object, though he could learn and retain the names of arbitrary characters.

“At the age of thirteen years he had grown much,

and enjoyed good health. He immediately recognised Mr. Haslam, and repeated to him the words *school, Moorfields, bad medicine*. At this period he had made comparatively great progress in language. He knew the names of common things, and could pronounce and point exactly the name of the street, and the number of the house, where he lived. Having contracted at the hospital the custom of making use of a vessel for his natural wants, he obstinately preserved it. His disgusting filthiness went so far, as to soil his own room with all sorts of excrements. It was always with extreme pleasure, that he saw other children give themselves up to any excesses in their sports. Incapable of uniting himself with them, he took no part in their recreations. When he was calm and in his natural state, he appeared to love his mother tenderly ; he was often seen even to caress her : but in his paroxysms of mania, his heart was closed against fear and tenderness. Twice he threw his knife at her. Every bright object fixed his attention, but more particularly the sight of soldiers and warlike music, of which he so well knew how to retain the notes, that he whistled them correctly. His phrases were short, and he never employed particles to unite them ; he always spoke of himself in the third person, and never made use of pronouns. His attention was never awakened, except by strong tones, or striking causes ; to ordinary things he was insensible.

“In the month of July, 1803, I was consulted for a boy of ten years, who had been sent here accompanied by a young man of gentle manners, charged with his superintendence. The parents of the child did not recollect, that any member of the family had ever experienced any mental affection. This child at the age of two years became so wilful and intractable, that they were obliged to banish him from the house of his father, and sent him to his aunt. There they satisfied all his desires, but he did not correct himself, and, at his ninth year, had become an obstinate and

capricious child, the plague of his family. At this period, by the advice of a physician, he was placed under the care of a stranger, and a different system of treatment was adopted. His superintendent was advised to correct him for every fault that he committed. He then refused to dress or undress himself, though he was still capable of it. If his hands were free, he tore his clothes, broke every thing which surrounded him, or which he could reach; and often refused to take any kind of nourishment. Constantly in opposition to the advice which was given him, he answered only by caprice to the questions, which were addressed him. For several months his superintendent treated him as had been agreed on, perhaps, however, not using all the severity which had been recommended; for, it is to be presumed, that, after some instances of severity, the voice of humanity prevailed over the orders of the physician. When the child became the subject of my observation, he enjoyed good health, and his head was well formed. Several distinguished anatomists, to whom he was presented, concurred in this opinion. His tongue, though excessively thick, did not prevent his articulating words very distinctly. His physiognomy evidently betrayed idiocy: he was of small stature, but strongly made; his soft and clear skin was destitute of sensibility. He bore the whip and the cane, manifesting less sensibility than other children. His pulse was natural, and his bowels regular. He had a good appetite without voracity. He could bear the privation of food for a long time without complaining. He appeared to need much sleep.

“Almost insensible to pleasure, he could, nevertheless, render a sufficiently exact account of what was agreeable to him. As he could not bring to any subject a sustained attention, and his attention could be excited only by lively and deep impressions, it may well be supposed, that he had not learned the letters of the alphabet, and still less, the art of copying them,



Several times they tried to send him to school, but he could never raise any favorable expectations in the masters, to whom he was intrusted, although they were distinguished for their patience and the vigor of their discipline. We may conclude, therefore, that under the discipline of the schools, he had derived all the benefit which could result to him from privations of every kind, and the most severe corrections.

“At our first interview he found means, in the space of three or four minutes, to break a square of glass and to tear the bosom of my shirt. Sworn enemy of all frail vessels, he broke all those which came within his reach. During his walks in the street, his superintendent took the precaution to place himself inside of him, for if he came within reach of windows, he broke the glasses, though so adroitly, that he never wounded himself. It was not without experiencing extreme joy, that he tore the lace and the most elegant fabrics of women; finally he scarce ever went out without turning to profit some occasion of satisfying his destructive propensities.

“Incapable of attaching himself to any feeble animals, far from having for any of them the friendship, which children usually lavish on them, he treated them with savage ferocity. An oppressor of every feeble being, he avoided those whose strength he feared. Having convinced himself of the superiority which he had over his cat, he tore out her whiskers with inconceivable barbarity, whenever she approached him; and, to render his own expression, said, ‘I must tear out her beard.’ When he had thus tortured her, he threw her into the fire, or out of the window. If a little dog approached him he kicked him away; if he happened to be large, he did not look at him. The sports of childhood had no attraction for him; and accordingly he took no part in them. Ignorant of the ties of friendship, he treated all children, without distinction of sex, with the same cruelty, and would have bitten or struck a girl, as soon as he would a boy.

Insensible to the marks of interest which were lavished on him, if an orange was given him, or any fruit, he received it as a favor, and threw it in the face of his benefactor.

“He appeared endowed with a kind of attachment to his guardian. If he went out of the apartment, or pretended to wish to leave it, he uttered cries, saying, ‘What will become of me if he leaves me. I love him because he carries the cane which makes me a good boy.’ In spite of these protestations, his preceptor often declared the intention of ceasing his superintendence when he should become older, persuaded, that he would kill him, when he found the means and the occasion.

“Sensible of his disease, he was often heard to express the desire of dying. ‘God,’ he said, ‘had not made him like other children.’ If he was irritated, he manifested a desire to destroy himself. Being led one day to the asylum at Bethlehem, when they showed him a subject more turbulent than the rest, and more closely confined, he was heard to say with emotion; ‘Here is a place which would suit me wonderfully well.’ We shall omit a number of other details, for which we refer to the work of Mr. Haslam.”

These really curious facts, which cannot be accounted for, on the common principles of philosophy, may readily be explained by our *physiology of the brain*. In fact, some idiots are gentle and others malicious; and this is a rule common to all beings. In idiots, some of their faculties are capable of being developed with extraordinary rapidity, while others, on the contrary, may be, so to speak, annihilated; and, as attention is the result of the activity of the faculties, it is possible, that this attention may be developed in some respects, and remain dormant in others. The second child, of whom Mr. Haslam speaks, directed his attention towards all the objects, which could satisfy his destructive propensity, and remained insensible to the

pleasures of friendship and to the sufferings of other creatures. Malicious idiots are not very rare ; and Dr. Halleran speaks also of several idiot children who, he was assured, had this propensity from their birth, and who, since they have been subjected to his observations, have continued to give unequivocal evidence of derangement.

The automatic functions, of complete or incomplete idiots from birth, are often without energy, and operate with more or less pain, especially as it concerns the functions of the intestines ; still those of automatic life are altogether natural, and often operate with vigor.

Complete idiots are rare in comparison with the incomplete ; and among these last, there are a thousand different degrees. The natural language always announces the degree of idiocy. The most idiotic are remarkable for the stupidity of their physiognomy ; they habitually gape, the saliva continually escapes from their mouths ; they have a silly look, and turn their head from side to side continually. The characteristic traits of incomplete idiots are a vague and wandering look, which nothing can fix, a continual agitation, and an absolute impossibility of collecting their ideas, or of combining the impressions which they experience ; but, in proportion as their intelligence is developed, their language becomes clear, and has more sense and expression.

### *Natural History of Benevolence and Docility in Animals.*

There is a great difference in animals, both as respects species and individuals, in regard to benevolence and docility of character. Some species and some individuals have naturally a good and gentle character ; others are malicious, and on all occasions bite, kick, butt, and strike with the horns. The chamois has not so gentle a character as the goat and the

sheep ; the tiger is more cruel than the lion ; the hyena, more to be feared than the wolf ; the wolf, more than the dog ; the angora cat is more gentle than the common cat. And among monkeys, what malice exists in the baboons, and what gentleness of character, in the ourang-outang and several varieties of apes ! The same difference is manifest in birds. The speckled hen (pintada) is much more malicious than the hen of our farm-yards ; the cuckoo, though destitute of weapons, becomes very malicious as soon as he is irritated. There are varieties of parrots which we cannot by any means keep from biting ; there are others, which caress every body, and always wish to be caressed.

Let us now extend our comparisons to individuals of the same species. Who does not know bulls, cows, oxen, sheep, goats, dogs, cats, cocks, extremely mischievous, without our being able to attribute their wickedness to any external circumstances, as education, &c. ? I have already spoken of two of my dogs, of whom one was as good as the other was wicked. They came from a litter of five pups. Before their eyes were opened, I remarked in them a very different conduct : one, when you took him in your hands, testified by his motions, that he was pleased ; the other growled, cried, and resisted till he was restored to his place. Hardly were they fifteen days old, when one testified by the movements of his tail his contentment and good will, not only to the other little dogs, but to all persons who approached him. The other, on the contrary, growled without ceasing, and bit whatever came in his way. From that time, I attentively observed these two animals. As I was not ignorant, that men attribute such differences of character to education, I charged all those who habitually approached these dogs, to lavish caresses on both of them equally. I took all imaginable pains to soften the character of my little wicked one ; but nothing could change him ; he even bit his mother, if she disturbed him ever so little. In their sixth month,



they were attacked with disease, and gently as both were treated, the wicked one did not cease to growl until his death, and to bite whatever approached him. The other, on the contrary, did not cease to his last moment, to show marks of attachment and gratitude to all who took care of him. Even my domestics were extremely struck with the difference of manner in these two dogs. All persons who have raised canary birds, must have remarked that, in the same covey, there are found some of a malicious and fretful character, and others, who are kind and gentle.

It is wrong to say, that nothing but the element of goodness exists in animals, and that this sentiment in them is limited to a passive gentleness. It is certain, that many animals are so controlled by this instinct, that they even risk their life to aid each other, when in the most imminent dangers. Swine, monkeys, dogs, several maritime animals, several species of birds, lend each other mutual assistance, and warn each other of danger by cries of alarm. Dupont de Nemours relates the following fact: "I saw a swallow," says he, "who had unhappily caught her claw in the running knot of a cord, the other end of which held to a gutter of the college of the Four Nations. Her strength being exhausted, she hung and cried at the end of the cord, which she sometimes lifted in attempting to fly away. All the swallows of the valley between the Tuilleries and the Pont-neuf, and perhaps some from a greater distance, had collected to the number of several thousands. They came in a cloud, uttering the cry of alarm and pity. After a long hesitation and a tumultuous council, one of them hit upon the means of delivering their companion, communicated it to others, and commenced the execution. They took their position; those who were nearest flew by, (as in the game, *running at the ring*,) pecking at the string as they passed. These blows, directed to the same point, succeeded from second to second, and even more rapidly. An half-hour's labor suf-

ficed to cut the cord, and set the prisoner at liberty. But the flock, only a little thinned, remained until night, still twittering, but without anxiety, as if addressing to each other their mutual congratulations.”

I have observed a similar fact. A bee was caught in a spider's web stretched near the hive. Immediately several bees threw themselves on the web and on the prisoner, until their unfortunate companion was released. A thousand examples prove that animals practise arts of compassion, and of the most active benevolence, not only towards their fellows, but also towards mankind. Do we not every day see dogs throw themselves into the water, to save persons who are in danger of drowning, and attack robbers with fury in order to preserve the lives of their masters? It would not be difficult even to prove, that several species of animals are furnished, to a certain degree, with a moral sense, with a sentiment of justice and injustice. Elephants, dogs, horses, monkeys, offer frequent examples of this, as well in their conduct to their fellows, as in that towards men.

*External Development of the Organ of Benevolence in Animals.*

This organ has its seat, in animals, as well as in man, on the median line in the superior anterior region of the upper part of the frontal bone; it likewise forms in them a lengthened protuberance from before backwards. But we must not forget that the anterior superior part of the forehead is wanting in animals; which causes their foreheads to be much shorter than that of man. Besides, as I have said elsewhere, this superior anterior part in many animals, has a different direction from that in man. In the horse and the ox, in general in all animals who carry the head so that the mouth is directed downwards, the superior part of the frontal bone is directed forwards; which causes us to call it the forehead; but

in fact it is the part, which in man corresponds to the superior anterior part of the head. By placing a horse's head on a table, one may easily convince himself, that what in him is called the forehead, is only the superior part of the head. In animals who carry their head like man, in such a manner, that the mouth is in front, the organ of goodness is situated as in our species.

Examine the region alluded to of the head or of the cranium of animals, who are distinguished, either by the savageness or the gentleness of their character, you will find it much more level in the tiger than in the lion; in the hyena and in the wolf, much more level than in the dog; in the common cat, more level than in the angora cat; absolutely flat and depressed below the level of the eyes in baboons. (Pl. LXVII. fig. 1. and 2.) You will see it, on the contrary, prominent in the ourang-outang, (Pl. LXXIX. fig. 4,) and in all the species of monkeys of a gentle character, (fig. 1, 2, 3.) When I see a forehead thus formed in a monkey, I do not hesitate to approach him.

A collection of heads of different individuals of animals of the same species, collected with reference to the benevolence or wickedness of their character, or the close observation of living animals made with the same purpose, furnishes undeniable evidence of the truth of what I advance. The adversaries of organology are as little disposed to form a collection, as to make observations; still, so long as they will not adopt this course, their objections will have no weight. It is only facts, such as nature offers, which are decisive.

Since a collection, such as I have indicated, may be of the greatest utility, even for economy both domestic and rural, I will give the reader some directions about it.

In the horse, the organ of benevolence is placed in the middle of what is called the forehead, three fingers breadth above the eyes. When this region is sunken

or retreating, we may be sure that the horse is vicious, unsafe, and disposed to bite and kick. (Pl. LXIV. fig. 1.) Gentle, docile, good horses, on the contrary, have this region on a level with the eyes, or even prominent, (fig. 2.) I have made thousands of observations on this subject, and have never found an exception.

Jockeys have another mark by which they distinguish the character of the horse. A gentle and docile horse stands with confidence, however spirited he may be in other respects, with his fore feet perpendicular, and the eye directed in such a manner, that we cannot see the white of the ball. A vicious horse, on the contrary, takes a position which indicates distrust; he places his fore-feet a little obliquely forward; when his conformation permits, he holds his head raised and a little retreating backwards; the direction of his eyes is constantly such, that a part of the white is visible. These signs are just; but they are not the organic cause of the good or bad character of the animal; they constitute only its representative.

I requested Col. Henry, director of the stables of the military school, to procure me two heads, one of a horse remarkably docile and good, the other of a horse remarkably vicious. The Colonel had the politeness soon to oblige me. Neither Mr. Henry nor the assistant veterinary surgeon saw any marked difference in the two heads; yet in my lectures they serve to demonstrate the character of the two opposite organizations. In that of the docile horse the region referred to, is arched nearly an inch higher than in that of the other.

A coachman at Neuilly bought, at a low price, a horse, which no one could use because of his extreme viciousness; but he was an excellent courser. In the first week, he bit off from his driver two fingers and an ear. This man hoped to correct the horse by beating him severely; but chastisement only rendered him still more mischievous; he therefore resolved to treat



him with gentleness ; this plan succeeded to a certain degree. The region indicated is much depressed in this horse, and the same conformation will be found in all those, to whom we are obliged to apply muzzles to prevent their biting.

If, besides the characters which I have just described, is added, that the two ears are close together, the horses are at the same time skittish and vicious. (Pl. LXIV. fig. 1.) It is of these that we should be particularly careful ; those that are mild, but good, are less dangerous.

The excellent princess of Schwartzenberg, who met so tragical an end at Paris, one day conducted me into her stables at Vienna, and begged me to point out to her, according to my organological discoveries, which of the thirty horses which were there, was the most gentle. The one which I pointed out was found to be the saddle horse of the princess herself ; he had been reserved for this service on account of his extreme gentleness.

At Berlin, at the stables of M. de Beyme, the minister of state, M. Spurzheim and myself pointed out, among forty cows, those that were most vicious.

M. the Marquis de Boisgelin presented me with the head of a tame wolf, which, from its birth, had been remarkable for his gentleness. Even at the moment when he was set at bay by sending him out with the hounds, he licked his master's hand, as if to implore his pity. In the region above described, his head is much more prominent, than that of wolves generally.

The heads of the two dogs, of which I have spoken, are distinguished by the same characteristics as the heads of the two horses first mentioned. One is prominent in the anterior part ; in the other, there is, on the contrary, a depression in the same region. One may infallibly distinguish, by this sign, between a snarling dog and a gentle one. Snarling dogs, especially when more than a year old, always exhibit a lengthened

depression in the middle of the anterior superior part of the head, which in other respects is flat. (Pl. LXX. fig. 4.) Good dogs on the contrary, have this region prominent, and the anterior superior part of their head especially is much rounder. (fig. 3.)

I possess a considerable collection of crania of dogs. The formation of each of these has confirmed the observations, which I had made on the living animal; but I would here observe, that we must not confound ill-humored dogs with vicious ones. There are dogs who always seek to fight, who growl continually, but never bite; there are among men similar characters; benevolent tormentors. What appears at the first glance to be malice, is a restive, odd, and testy humor, rather than malice, strictly speaking; traits by which Xenophon has characterized Xantippe: all my numerous heads of cats, whose dispositions I have known in regard to gentleness or viciousness, confirm my observation. The heads of the vicious cats are always much more depressed and flattened in the anterior superior region, than those of cats of a mild, social character.

At the king's garden, we made observations in this respect on the tiger, the panther, the hyena, and on wild animals of various species, which are perfectly satisfactory. Those animals, which have the region alluded to the most depressed, are always the most wicked, and the most intractable. Compare the head of the Indian hog possessed of a very gentle nature, (Pl. LXVI. fig. 6,) with that of the wicked hamster, (fig. 7;) the head of the latter is so much depressed, that it seems to be broken.

The brown bear has the head much more elevated than the extremely ferocious and savage white bear. Among pigeons, the most vicious *columba nicobatica*, crested pigeon, has the most flattened head.

Amphibious animals, crocodiles for example, as well as ravenous fishes, such as the pike and the shark; the eagle, (Pl. LXIV fig. 11,) the falcon, the chamois

(Pl. LXXIII. fig. 1.) have this region sometimes flat, sometimes depressed. The sheep, the goat, the roebuck, (Pl. LXV. fig. 3 and 4,) on the contrary, have it swelled into a lengthened protuberance.

In the cock, the canary bird, and many other species, whose character I have long observed, this fact is likewise confirmed. This character may generally be referred to for all animals, in which the internal table of the frontal bone is parallel to the external, as in the horse, the monkey, the dog, and several species of birds. It is otherwise when the internal table of bone diverges from the external. It is therefore necessary to know the structure of the cranial bones in the species, on which one wishes to pass judgment. In the elephant, the hog, &c., we cannot infer from the contour of the cranium, the form of the brain. In the bull and the cow, the internal table diverges indeed from the external, but they are parallel in the region where the organ of benevolence is placed; on that account, when a bull or a cow has this region depressed, we may conclude, that they are mischievous, and that they are gentle, when this region is flat or even prominent. The same thing takes place in cats.

What I have said above explains, why the character of animals, that have received the same education, and been placed in the same circumstances, may yet totally differ. The reason of this difference is not such as we have seen it in external objects; it depends on a peculiar cerebral part, of which the greater or less development does not itself depend on external circumstances, but on a law of original organization, which is still unknown to us.

XXV. *Faculty of Imitation, Mimicry.**History of the Discovery.*

When I was talking with one of my friends, respecting the forms of the head, he assured me, that his own had a very peculiar one. He then directed my hand to the anterior superior part of his head ; I found this region considerably bulging ; and behind the protuberance, a depression, a cavity, which descended on each side, towards the ear. At this period, I had not observed this conformation. This man had a peculiar talent for imitation. He imitated in so striking a manner the gait, the gestures, the sound of the voice, &c., that the person was immediately recognised. I hastened to the institution for the deaf and dumb, to examine the head of the pupil Casteigner, who had been received into the establishment six weeks previous, and who, from the first, had fixed our attention by his prodigious talent for imitation. On Shrove Tuesday, when a little theatrical piece is usually represented in the establishment, he had imitated so perfectly the gesture, the gait, &c., of the director, inspector, physician, and surgeon of the establishment, and especially of some women that it was impossible to mistake ; a scene, which amused the more, as nothing like it was expected from a boy, whose education had been absolutely neglected. To my great astonishment, I found in him the superior anterior part of the head, as prominent as in my friend Annibal.

Can the talent for imitation, I asked myself, be dependent on a peculiar organ? and I sought opportunities for multiplying my observations. I visited families, schools, &c., and examined the heads of individuals, who possessed the talent for imitation in an eminent degree. At this period, M. Maix, secretary to the minister of war, had gained great reputation by several parts, which he played in a private



theatre. I found in him the region of the frontal bone alluded to, as prominent as in Casteigner, and Annibal. In all the other persons, whom I examined, I likewise found this region more or less prominent, according as they were endowed with the talent of imitation to a greater or less degree. They relate of Garrick, that he possessed a faculty of imitation so astonishing, that he forgot nothing of the retinue of the court, composed of Louis XV., the duke d'Aumont, the duke d'Orleans, of MM. Aumont, Brissac, Richelieu, the Prince of Soubise, &c. All these personages, whom he saw but once passing by, were fixed in his memory. He invited to supper the friends, who had accompanied him; Garrick, impatient to amuse his friends, says to them: "I have seen the court only an instant, but I am going to prove to you the accuracy of my eye, and the excellence of my memory." He then arranges his friends in two lines, goes out, and an instant after returns to the parlor. All the spectators exclaimed, "There is the king; there is Louis XV.!" He imitated in succession all the personages at the court; they were all recognised. Not only had he imitated their gait, their walk, their figure, but even the lines and the character of their physiognomy. I soon perceived, that this faculty must constitute a considerable portion of the talent of the comedian. I therefore examined the heads of the best actors which we then had; Müller, Lange, Brockmann, Schræder, Baumann, Koch, and his daughter, &c. In all I found the region alluded to prominent. I procured the head of Jünger, the poet and comedian. His cranium serves me now for demonstrating the organ of imitation.

In our travels, M. Spurzheim and myself found the same organization in all the great comedians, that we had occasion to examine; in Ifland, Madame Bethmann, Nagelman at Berlin; in Ochsenheimer at Leipzig; in Kruys at Amsterdam; Madame Brede at Bremen; Manteufel, Talma, &c.

Examine the portraits of the great comedians, that

have the region of the head alluded to, bald, and you will see, that it is very prominent; as in Shakspeare, (Pl. xciii. fig. 3,) and Müller, (fig. 4;) or even when this region is covered with hair, the hair forms a tuft which rises perpendicularly, by reason of the protuberance on which it grows, as in Lekain and Garrick. In others we remark distinctly, that the superior part of the frontal is prominent, as in Clairon, Boran, Molière, Corneille, Pylade, Prévile, Siddons, Eckoff, Molé, Messrs. Fleury and Larive, &c.

In the house of correction at Munich we saw a thief, who had this organ rather developed. I told him, that he was a comedian; surprised by this discovery, he confessed, that he had for some time made part of a strolling company. In the establishment they were entirely ignorant of this circumstance, which, until that time, he had carefully concealed. Since then I have so greatly multiplied these observations, that I think myself authorized to admit, that the talent of imitation, the talent of mimicry, that is to say, the faculty of personifying, in some measure, ideas and sentiments, of representing them with justice by gestures, is a proper fundamental faculty, which is dependent on a particular organ. This organ contributes without question to make of the poet, a dramatic poet, such as Terence, Shakspeare, Corneille, Molière, Voltaire, &c.

There is no doubt, that it is to this organ, that we are indebted for comedy.

This talent for imitation will manifest itself with so much the more energy and extent, as it is accompanied with a greater vivacity of feeling, and a greater number of other distinguished faculties. The variety of other organs, which accompany that of imitation, constitutes the difference in actors. The parts of waiting-maids, valets, simpletons, buffoons, fops, lovers coquettes, tyrants, sharpers, demand, each a peculiar energetic disposition. And if an actor is equally great in opposite parts, we must conclude, either that he has a complicated talent, or, that he is indebted rather to study, than to nature, for his success.

*Confirmation of the Existence of the Fundamental Faculty of Imitation, and of its Particular Organ.*

Most of the great comedians were originally destined to a different employment, but have withdrawn themselves from their primary destination, to devote themselves to this art, toward which they were drawn by an unconquerable passion. Garrick quitted the counting-room of a merchant, to join a company of strolling players; Lekain was first occupied in making surgical instruments; Clairon, born of a poor cook, and not disposed to follow the career of her mother, embraced the theatrical profession. Molière, son of a valet-de-chambre, upholsterer of the king, left his trade, feeling himself drawn by an irresistible passion to the theatre. Corneille was destined to the bar.

This talent is often manifested in a very active manner from the most tender age, and at a period when the other faculties are by no means developed. William Henry West Betty was fourteen years old, and had yet received no instruction in acting or in declamation; when he appeared in public for the first time, he had never seen but a single representation; he had seen the death of Rolla played in a small town. Jackson, the manager of the Edinburgh theatre, asserted, that he had never seen his equal. West Betty was often playing in the streets with the boot-blacks, and they were obliged to go and seek him in the midst of them, to make him appear on the stage. 'The faculty of imitation is exercised sometimes even in idiots and madmen. "A young idiot," says M. Pinel, "whom I have long had under my eye, has the most marked and irresistible inclination to imitate all that she sees done in her presence; she repeats mechanically all that she hears said, and imitates with the greatest fidelity the gestures and actions of others, without much regard to propriety. I would refer here to the

history, which I have already quoted from Mr. Haslam, of the malicious idiot, who, a short time after he was received at the hospital, showed a great talent for counterfeiting the insane.

Cabanis reports the history of a man, so restless, that he was forced to repeat all the movements and attitudes of which he was a witness. "If he was prevented from yielding to this impulse, either by seizing his limbs or by making him take contrary attitudes, he experienced insupportable agony; here," adds Cabanis, "as we see, the faculty of imitation is carried to the extent of disease."

All the phenomena, which I have related, are inexplicable, unless we admit, that the imitative talent is a fundamental faculty.

This organ is in general more useful, than it appeared at the first glance. It is of great use to the orator, inasmuch as it animates his discourses by just declamation, and by accompanying them with gestures appropriate to his words.

But, it is especially in the arts of design, that this faculty is important. It is that, which gives expression and life to the works of art. I have already said, that I have found the organ of imitation extremely developed in the cranium of Raphael, who, in regard to expression, holds the first rank among painters. I find it likewise very decided in Dominichino, in Rubens, Poussin, Lesueur, who distinguish themselves particularly by the force of expression.

I know several persons, women especially, who have the talent of imitation to a very high degree, and who are never more happy, than when an occasion presents itself for masking. It is the same with children thus organized, who are usually the mimics of the family.

I have even observed in monkeys, a singular propensity to disguise themselves. One of my monkeys, a male ape, had no greater pleasure than to throw a



towel over his head, and then spring thus muffled on his female, or on persons whom he wished to terrify.

### *External Development of the Organ of Imitation.*

It is to be remarked, that the organ of imitation does not always manifest itself under the same form. In most cases, it forms a prominence in the shape of the segment of a sphere, a little higher than the organ of benevolence. But sometimes, also, it forms two lengthened prominences, which extend from before backward, placed by the side of the organ of benevolence. The cause of this difference is as follows.

By the side of the two convolutions, which constitute the organ of benevolence, are found placed the two convolutions xxvi., Pl. viii. ix. x. As the two last are very near the two first, they elevate all the middle of the superior anterior region like an arch, or segment of a circle ; this happens especially when the organ of benevolence has not acquired any considerable development. Generally, the organ of imitation is distinguished from that of benevolence, inasmuch as it is placed a little higher, and has a more rounded form. Yet, as I have just said, it also happens, that the last, by a great development of the convolutions which constitute it, presents itself under the form of two prominences ; probably because the two convolutions are more distant.

### *Of Visions.*

Certain persons have apparitions of the dead or absent. How happens it, that frequently men of much intellect believe in the reality of ghosts and visions? Are these visionaries, fools ; or, are they impostors? Is there a peculiar organization in man, which thus deceives? How can this deception be explained?

Let us commence by giving the facts.

Socrates used often and very willingly to speak to his disciples, of a demon or genius, which he pretended served him as a guide. What was this familiar demon, this divine voice, this spirit, which answered constantly, when he consulted it? I know well how persons, who do not understand the peculiar organization of which I am going to speak, explain this genius: "It was nothing but the force and justice of his judgment," &c. But what reasons could Socrates have for imposing on his disciples? Even in his defence, he still expresses himself in an enigmatical manner. "As to the particular genius, of which I hear the inspiration, it is not a new divinity, it is the eternal instinct, the eternal genius of morals. To guide themselves, some consult sybils, others, the flight of birds, others, the hearts of victims. For myself, I consult my own heart; I question my conscience; I converse in secret with the spirit which animates me." These words, if you wish it, prove that he was persuaded, that his genius dwelt in himself, but by no means that he had confidence in any thing but the soundness of his own judgment. Besides, he tried to justify himself, also, for not admitting the divinities of Athens. If Socrates himself had not believed in this genius, the generally diffused opinion, that he had one, would have been lost after twenty-three years, when Aristophanes made it a subject of ridicule, and this genius would not have been reproduced among the points of accusation.

Nicolas Gabrino, (Rienzi,) as well as Cromwell, is quoted for a hypocritical impostor, making religion serve as a cloak to his designs, and putting in operation revelations and visions, in order to gain authority from them. I every day hear similar charges made by persons, who do not reflect that others, with the best faith in the world, may have different sensations, impressions, sentiments, from themselves, and consequently, believe in something different from the objects of their own faith.

Joan of Arc was still in the flower of her age, when, with a disposition of mind already exalted by preceding circumstances, she imagined, that she saw on her right, and from the side of the village church, a great light, whence proceeded an unknown voice. Some time afterward, the same voice was heard, and celestial beings offered themselves to her observation. St. Michael said to her, that God had taken pity on France, and ordered her to go and raise the siege of Orleans, and then have king Charles VII. consecrated at Rheims. Her visions induced her parents to present her to Baudricourt de Vaucouleurs. . . . .

The Jesuits Maffey and Bouhours certainly were right in attributing visions to St. Ignatius.

Tasso pretended one day to have been cured by the aid of the holy virgin, and of saint Scholastica, who appeared to him during a violent paroxysm of fever. In the historical notes, which accompany the life of Tasso, we read the following anecdote taken from the memoirs of Manso, marquis of Villa, published after the death of his friend Tasso.

"Tasso, in his delirium, thought he conversed with familiar spirits. One day, that his friend the marquis tried to get this idea out of his head, Tasso said to him :

" 'Since I cannot convince you by reasoning, I will convince you by your own experience : you shall see the vision in which you will not believe.'

"I accepted the offer, and next day, while we were sitting, talking near the fire, he turned his eyes toward the window ; and looking fixedly, appeared so much absorbed, that, when I called him, he did not answer. 'There it is,' said he, at length, 'that familiar spirit which does me the favor to come and talk with me.' I looked with all attention, and saw nothing pass into the room. During this time, Tasso entered into conversation with this mysterious being. I saw and heard Tasso only. Sometimes he questioned ; sometimes he answered ; and by the sense of his

answer, I comprehended what he had heard. His discourse was so sublime in its subject, so lofty in its expressions, that I felt a sort of ecstasy. I dared not interrupt Tasso, or address him any questions on what I did not see, and it was a long time before the spirit disappeared. I was informed of this event by Tasso, who, turning towards me, said: 'In future you will have no doubt.' That is, said I, I shall have more than ever, for though I heard many marvellous things, I saw nothing whatever. He replied, smiling: 'You have perhaps heard and seen more than' — He stopped there, and fearing to importune him by questions, I let the conversation drop."

Swedenburg thought himself miraculously called to reveal to the world the most hidden mysteries. "In 1743," says he, "it pleased the Lord to manifest himself to me, and to appear to me personally, to give me knowledge of the spiritual world, and to put me in relation with angels and spirits, and this power has been continued to me until this evening." Swedenburg, say the authors of the English Biography, was the most sincere man in the world, the most extravagant of enthusiasts; an opinion in which I fully concur.

Doctor Jung Stilling, whom we saw very often at the late grand duke of Baden's, was in his youth, a tailor, then an instructor, afterward doctor of medicine, moralist, religious writer, journalist, illuminati, visionary. He believed firmly in ghosts, and wrote a work in which he seriously lays open his doctrine. We shall see, in regard to this man, that his whole life bears the impress of his organization.

I have already spoken above of the fanatic, who was pointed out to us in the house of correction, at Berne. Hardly had I seen him descend the stairs, when I exclaimed, they are bringing me a visionary. He was the same, to whom Jesus Christ appeared in the midst of a light, as brilliant as if it had been



formed by many thousand suns, to reveal to him the true religion.

A man, who is admitted into the best society at Paris, wished to know my opinion of his head. The only thing I told him at the first view, was, that he sometimes had visions, and that he believed in ghosts. He leaped from his chair in astonishment, and told me, that he often had visions, but that, until this moment he had never spoken of it to any one, for fear of being thought over credulous. I said to the physician, Dr. W., that I saw by the form of his head, that he had a great propensity for the marvellous, and the supernatural. "For this time," he answered, "you are mistaken, my dear Doctor, for I have a rule for myself, never to admit any thing as true, which is not mathematically proved." After having conversed with him on several subjects of science, I turned the conversation to animal magnetism, which appeared to me a very proper test, by which to appreciate the mathematical rigor of my estimable brother. He became very animated, and again assured me, that he regarded nothing as true but what was mathematically demonstrated; but that he was convinced, that a spiritual being acted in magnetism, and that this being acted at great distances; that there was not, in fact, any distance which was capable of preventing his action; and that by reason of this, he could sympathize with persons placed in any part whatever of the world; "it is the same cause," he continued, "which produces apparitions. Apparitions and visions are indeed rare; but they undoubtedly exist; and I well know the laws, according to which they take place." I said to myself: Here organology has not been at fault.

I have also spoken above of one Hallerau, of Vienna. This man was constantly accompanied by his familiar genius; he saw him and conversed with him. When he had reached his sixtieth year, it seemed that his genius wished to quit him. There

were afterward only certain days in the month, when he had the good fortune to see him.

I knew at Gersbach, near Durlach, in the Grand Duchy of Baden, a curate, who was put in durance because he had likewise a familiar spirit. There is at Manheim, a man, who always thinks himself accompanied by several spirits. Sometimes they walk by the side of him, in visible forms; at other times, they accompany him only under ground. Pinel speaks of a very dangerous maniac, who was calm only during the day; but who, during the night, believed himself always surrounded by ghosts and phantoms; who converses in turn with good and evil angels, and who according to the character of his visions, is benevolent or dangerous, inclined to acts of kindness or to acts of barbarous cruelty.

History, both ancient and modern, furnishes a great number of examples of the same kind.

If it be ridiculous to admit the reality of apparitions, demons, and familiar spirits, it is also unjust to accuse of imposture, those who pretend to have had them. There are few persons in whom one can suppose address and wickedness enough, to counterfeit fraudulently those phenomena, which the observer alone knows in all their shades. I shall show, that these men are the sport of too energetic an activity of a part of the brain.

### *Organization which Disposes to Visions.*

In the first fanatic whom I saw, I was struck with the rounded prominence of the superior part of the frontal bone. This prominence does not form in the middle of the head a lengthened protuberance, as the organ of benevolence; neither is it the elliptic protuberance of imitation. Here all the part of the frontal bone is prominent in the form of the segment of a sphere.

Between convolutions xxv. which constitutes poetical talent, and xxvi. formed by that of imitation, is placed another convolution, Pl. viii. ix. x. of which the considerable development involves probably the disposition to visions. Does this convolution make part of the organ of imitation, and does its excessive development exalt the talent for imitation, so as to cause it to give to ideas of its own creation, an external existence, and make them appear as coming to us from without? Or does this convolution at the same time make part both of poetry and imitation? Or, in fine, does it constitute a particular organ? This is what further researches alone will be able to decide.

As it is very possible that visions are only the blended result of an exalted action of one of those two organs, or of the two together, I have not thought it necessary to consider it as a particular organ.

Now let the reader examine the heads of all those persons who, without being attacked with a mental malady, were peculiarly disposed to visions. Let him compare the portraits and the busts of Socrates, Pl. xcii. fig. 1; of Gabrino, Pl. xciii. fig. 5; of Joan of Arc, of St. Ignatius, fig. 6; of Tasso, fig. 7; of Cromwell, Pl. xcv. fig. 4; of Swedenburg, &c.; the same organization, which they there remark, is found likewise in Jung Stilling, in Hallerau, in M. de F., and in Dr. W.

Till now I have mentioned only facts, and in what I have said, have had nature alone for my guide. I shall now give an explanation, the value of which the reader will judge.

### *Explanation of Visions and Inspirations.*

The explanation which I have given of dreams, Vol. II. p. 506, opens to us the way for the explanation of visions and inspirations. During dreams, all that we see, all that we hear, as passing in the external

world, is in fact passing within us. The furious horses and the carriage, with which we are thrown over a precipice, the torrent which sweeps away our child, is *ourselves*. That, which in the state of waking, would be a lively impression, a clear idea, becomes, during sleep, the very object which produces the impression, which gives rise to the idea. It is thus, that the man who dreams, becomes for himself the most perfect comedian. The animal and the man during waking, have the faculty of distinguishing the impression and the idea from the external object, which produces it. This faculty is lost during sleep. Now, as we cannot have the consciousness of these objects as existing within us, by virtue of a law of nature, we place them without ourselves. In this sense, every dream is a vision, an apparition.

Whenever, in health or disease, the sentiments and ideas are produced with such rapidity and vivacity, that we cannot distinguish them from the objects which produce them, (in consequence of the laws of our sentiments and our ideas,) we give to them external existence, or personify them and have a vision.

When this extreme activity of the internal senses is temporary, when the person has time to recollect himself, when other feelings and other ideas come to weaken the first, when certain movements which are performed involuntarily, give a different course to the circulation of the blood, and recall us to ourselves, the vision or apparition disappears; we again distinguish the sentiment or the idea, from the object which produces it; the dream we had ceases when we wake. In this case, this state is a temporary alienation which, however, for the most part, leaves such an impression, that it is very difficult to undeceive persons who have had such visions. In certain persons, these visions are periodical, and take place usually at the periods of an accession of irritability, of hemorrhoids, of the menstrual discharge, &c.

In others this state is more durable, in proportion to



the duration of the excitement. An habitual nervous excitement, an exertion of mind too long continued and fixed on the same object, fasts, prolonged watchings, plethora, suffice to excite it. Nervous or plethoric persons, endowed with the organization in question, are usually those who pretend to have a familiar spirit. As they do not feel themselves ill, it is very evident, that they place in the external world, what really exists only in themselves. They are in the same predicament with madmen, who seem to embrace the object of their affection, to fight against robbers or against the devil. And as it is impossible to convince a maniac that he is insane, so also is it impossible to make a visionary understand, that he is deranged.

Now it would appear, that an extreme development of the convolutions, placed between the organ of imitation and that of poetry, disposes to this excessive irritability. And what is there in fact more analogous than the poetical talent and the talent for imitation, and the tendency to visions? I am not far from believing that the exaltation of the organ of propensity to religion contributes, at least in many cases, very much to visions. These visions explain, why all visionaries carry in their outward demeanour, the impress of sanctitude, exaltation, inspiration, something in fact more than human.

It appears, that inspirations must not always be referred to the same source. In many cases, they are only the effect of the irregular and involuntary activity of a single organ, by means of which man feels a violent impulse, which seems to him to act independently of himself, an impulse which he attributes to a force without himself, and which, on that account, he must regard as an inspiration, an order, a command received from elsewhere. We must pardon the ignorance and superstition which seek, in the impulse of beneficent spirits or malicious demons, what the naturalist finds in the vicious action of an over-irritated organ.

Visions are not rare in mania. "Nothing is more common in hospitals," says M. Pinel, "than the nightly or daily visions, experienced by certain women attacked with religious melancholy. One of them thinks she sees, during the night, the Holy Virgin descend into her cell in the form of tongues of fire. She asks to have an altar built there, to receive in a worthy manner the sovereign of heaven, who comes to converse with her and console her for her sufferings. Another woman of a cultivated mind, whom the events of the revolution have thrown into profound melancholy and a maniacal delirium, goes constantly to walk in the garden of the hospital, advances gravely with her eyes fixed towards heaven, thinks she sees Jesus Christ with all the celestial court, march in order of procession in the upper air, and warble songs accompanied by melodious sounds; she herself advances with a grave step to accompany the procession; she points it out, fully convinced of its reality as if the object itself struck her senses. She gives herself up to violent passion against all those, who would persuade her to the contrary." \*

This would be the place to treat of animal magnetism; but as this singular subject would be too long an interruption of the exposition of the organs, I shall defer it to the sixth volume of the work.

## XXVI. *God and Religion.*

God and religion have always been objects so important to man, that all, which can be said on this subject, seems exhausted. There are no ideas relative to these subjects, from the grossest superstition to atheism, which ignorance or the different sects of philosophy, have not tried either to accredit or to refute. According to certain philosophers, it is man, terrified by the great phenom-

---

\* Of Mental Alienation, 2d, ed. p. 108, 109, § 122.

ena of nature, who has referred their cause to omnipotent beings; according to them, the doctrine of the existence of God is the work of human prudence, an artifice of legislators to lead the people by fear, imposture, and superstition. Interrogate the history of nations on the origin of their belief; there is not one, which does not boast a supernatural origin, a divine revelation of its religious mysteries.

Not wishing to treat this noble subject, except as a naturalist and physiologist, I shall limit myself to examining whether man, by means of his organization, has been prepared for belief in an independent intelligence, in a God, religious sentiments, and worship.

*History of the Discovery of the Religious Sentiment,  
as a Fundamental Quality, and of its Organ.*

There were ten children of us in the house of my father; my brothers and sisters and myself all received the same education, but our faculties and tendencies were very different. One of my brothers, from his infancy, had a strong tendency to devotion. His playthings were church vases, which he sculptured himself, copes and surplices, which he made with paper. He prayed God and said mass all day, and when he was obliged to miss service at church, he passed his time at the house, in ornamenting and gilding a crucifix of wood. My father had destined him to commerce, but he had an invincible aversion to the business of a merchant, because, he said, it forced one to lie. At the age of twenty-three years, he lost all patience; having lost all hope of pursuing his studies, he fled from the house and turned hermit. Five years after, he took orders, and, till his death, lived in exercises of devotion and penance.

I observed in schools, that, independently of other faculties, certain pupils had no susceptibility for receiving religious instruction, while others were very eager

for it. I had also remarked in all the classes, that those, who designed themselves for the ecclesiastical profession, were either studious, pious, decent young persons, or idle, indolent, and without talents; these last had no other intention than to be supported at the expense of their fellow citizens; the first, on the contrary, felt an inward call to the profession to which they aspired. This inclination was born in them, without its being known how, and without its being possible to attribute it to example, education, or surrounding objects. Most of these young persons devoted themselves to this career, contrary to the wishes of their parents and their instructors.

Afterwards, no sooner had some fundamental qualities or faculties fixed my attention, than I recalled the observations, which I had made in my infancy on myself and on my fellow pupils. I examined the form of the head of persons, who were distinguished by their devotion, for, I was then already persuaded, that the tendency to piety and to the exercises of devotion, is innate. I visited the churches of all sects, and devoted myself especially to observing the heads of those who prayed with most fervor, or, who were most absorbed in their pious contemplations.

I was first struck by the circumstance, that the most fervent devotees I had seen, were almost always bald. Yet, I asked myself, what can baldness have in common with devotion? Women are rarely bald, yet they are more devout than men. I soon observed, however, that bald heads often rise gradually to the top, and that it was precisely this form of head, which had first struck me. As soon as I was convinced by a considerable number of observations, that most devout persons have their heads so formed, I visited the monasteries and observed the monks, taking care to collect, at the same time, exact informatin in relation to their moral character. My observations were confirmed in those who performed the functions of preacher and confessor, but not always in the servants, as the butlers, cooks,



&c. I made the same investigation with regard to the heads of other ecclesiastics. I was especially struck with the difference of conformation, which existed among several ex-jesuits. All those, who applied themselves to the exercises of devotion, had the head greatly elevated toward the crown. I could therefore presume, that I had discovered the organization which disposes to devotion, and which gives birth to religious sentiments.

I have remarked, at the same time, that the portraits of ecclesiastics, known by their zeal in their religious functions, have always the head greatly raised in the crown.

The ancient artists represented high-priests and sacrificers, with venerable heads thus formed.

Before citing my last observations, which I have always continued to multiply, I will describe the natural history of the belief in God, and of the disposition to religious worship. I hope in this way to produce in my readers the conviction, that the sentiment of these two august objects, is inherent in our nature: that consequently, it is a fundamental sentiment, to which a part of the brain of man is particularly adapted.

*Natural History of Man, in Relation to his Belief in God and his Propensity to Religion.*

Every where and in all ages, man, urged by the feeling of his dependence upon every thing around him, is forced continually to acknowledge the limits of his strength, and to confess to himself, that his fate is controlled by a superior power. Hence the unanimous consent of all nations to adore a Supreme Being; hence a necessity, ever strongly felt, of recurring to Him, of honoring Him, and of rendering homage to His superiority.

Men necessarily formed to themselves very elevated

conceptions of the First of powers. The idea they necessarily formed, was that of a Being superior to all others, of a spirit diffused throughout the universe, which animates all, which sustains every thing by its presence, which is the principle of generation and production ; it was the idea of a flame ever burning, of Omniscience whose providence watches without ceasing over all, and extends to all ; in a word, of a Being to whom, by reason of his independence and his superiority, they had given different names, but always corresponding to some one of his infinite perfections, and which ever bore the character of that sovereign dominion, which belongs only to the Great Ruler of all things.

To this idea of the ancients, correspond perfectly those of the idolatrous nations which still exist ; the terms of their language manifestly designate a Superior Being. It is not only cultivated nations, which have these marks of the knowledge of a First Cause, such as, among the Chinese, *Tien-Chu*, that is, Master of Heaven, and the *Xang-ti*, the sovereign emperor and sovereign master ; among the Indians the *Kertar*, he who makes all things, and the *Serjenhar*, the creator of the world. Among the tribes of Peru, the *Pachacamac*, or the Supreme Being, and the *Viracocha*, which is the God, Creator. The same traces are likewise seen among all the nations, which pass for barbarians. Generally, all those of America, whether wandering or sedentary, have strong and energetic expressions which can refer only to a God ; they name him the Great Spirit, sometimes the Master and the Author of Life. Even down to the Ouraoars, (*Ottawas*,) who, among all these nations, appear the most brutal, and least refined, there are none who, in their invocations and their apostrophes, do not often name him the Creator of all things.

That great spirit, known among the Caraihs under the name of *Chemiiin*, under that of *Manitou*, among the Algonquins, and under that of *Okki*, among those

who speak the Huron language, is designated in a manner the most singular, and applicable only to the Supreme Being, by the name of Areskouï, among the Hurons, and by that of Agriskoue, among the Iroquois.

Such then is the sense of the Divinity, that there is not a single nation, however barbarous, however destitute of laws or of morals, it may be, which does not believe, that there are Gods. The belief in God is as ancient as the existence of the human race. Nature herself has engraven the idea of God in all hearts; and this idea is too sublime for man to have been able to conceive it, if Nature herself had not conducted him to it.

Now the sense, or the knowledge of a Divinity, infallibly brings with it a religious worship, that is, an assemblage of duties, by which man makes to it an humble confession of his dependence, by the homage which he pays to the dignity of its being, by his obedience in submitting himself to the laws which it prescribes to him, by his gratitude for the benefits he receives from it, and by the recourse he is obliged to have to it, for the benefits he receives, and those he hopes for.

This is the reason why the means, which men put in operation to render themselves agreeable to the Divinity, are as ancient as the belief in a God; and to prove the universality and high antiquity of this belief, is to prove the universality and the remote antiquity of religious worship. Moreover, as every religion supposes the idea of a Supreme Being, whoever shall prove the universality and the high antiquity of any religion whatever, will also show the generality and high antiquity of a belief in God. Men always have been led by an instinct, by a secret impulse, to acknowledge an omnipotent Being.

But the human mind, too limited, has not been able to collect under a single point of view the infinity of

the attributes of God. It was obliged to make a kind of division, to represent each one by different names, emblems, of which each one marked only the perfections which it attributed to him. Man can only see God in a mystery, as St. Paul says; he figures him to himself under sensible images, which are so many symbols raising themselves to him by degrees.

Hence, however, results the origin of idolatry, and of the well merited reproach, that man is a superstitious animal. In fact, man adores every thing, fire, water, earth, thunder, lightning, meteors, grasshoppers, crickets. The Mexicans adored Viziliputzli, the God of war, and Tescaliputza, the God of repentance. The negroes and the savages of America have the worship of the gods Fetiches; it has for its object animals or inanimate beings, even the most absurd. The striped snake is the natural divinity of the nations of Judah. Several American tribes have crocodiles for gods, as the Egyptians, or salt water fish, as the Philistines. In the peninsula of Yucatan, children are placed under the protection of an animal chosen by lot, which becomes the tutelary divinity of his person. The Laplanders and the Samoïedes render divine honors to several species of animals, to stones, which they anoint, as formerly in Syria they adored the stones called boetiles, and as in America they still adore conic stones. The ancient Arabians had for their Divinity a square stone, and the god Casius of the Romans, whom Cicero calls Jupiter-Lapis, was a round stone cut in halves. Jacob himself erected and anointed a stone in the place, where God had manifested himself to him in a dream. The Hebrews, like most other nations, had a great veneration for mountains, *high places*, and woods. The ancient Germans, had, for their Divinity, tufted trees, fountains, and lakes; they adored, as the Laplanders now do, shapeless trunks, which they regarded as the representation of the divinity. The Franks adored wood, water, birds, and beasts. These first forms of worship established



among the Egyptians, Hebrews, Germans, are again found among the ancient nations of Greece, and one cannot but be struck by the conformity. Stones, shapeless trunks, rude cippi, were afterward the principal gods of the Greeks. The Venus of Paphos was a white pyramid; the Diana of the isle of Eubœa, was an uncarved block of wood; the Thespian Juno, the trunk of a tree; the Athenian Pallas and the Ceres, a simple stake which was not stripped; the Matuta of the Phrygians was a black stone with irregular angles, which was said to have fallen from heaven to Persinun, and was afterward carried to Rome with much respect. Men, besides these absurd national divinities, have had different peculiar objects of worship, from whom they expected peculiar and individual protection. Such were the Mannikins of Laban, the household gods among the Romans. In the kingdom of Issini, one chose for his Fetiche a block of wood, another the teeth of a dog, of a tiger, of an elephant. The seas were peopled with Tritons, with Nereids, with Divinities of different orders. The country was filled with Nymphs and Fays; the forest, with Dryads and Hamadryads. Every stream, every fountain, village, and city, had its divinities. All agreed in thinking, that these divinities exacted honors, that they were easily irritated, but that they were appeased by bloody sacrifices. Barbarity was every where urged, even to the immolation of human victims. Add to all this, the adoration of trees, the idols of the Chinese, the palladium of the Trojans, the sacred buckler of the Romans, the universal confidence which men have in talismans and amulets, in divination, dreams, and oracles, in the meeting of different objects presented by chance, as, for example, the unexpected encounter of a dead body, of a cat, in the cry of nocturnal birds, in the flight of birds, in penitences and mortifications of every kind.

This hasty sketch shows us plainly enough, that from east to west, from north to south, the people have

not only the same objects of adoration, but nearly the same manner of worship, and a uniform practice of the same maxims. "The divinity offers himself under the moral relations, which constitute his essence, only to men enlightened by elevated instruction; but the ignorant man, in all countries and ages, will naturally be an idolater, naturally an adorer of idols and of supernatural things, because they arrest and fix his attention, because they act upon the mind rather than upon the sight; because, in fine, they make him think and reflect." \*

Yet, however degraded man may appear in this light, he perhaps deserves our pity as much as our blame. His ignorance, and his natural tendency to superstition, have converted into sensible images, abstract ideas and truths, which are beyond the reach of the ordinary intelligence of ignorant men, and have caused him to address to the creature, the worship due only to the Creator. Fear has made as many idols as there are objects of terror. But the essential point, namely, the acknowledgment of a Supreme Being, and of religious worship, has always remained invariable.

The sun, honored by a peculiar worship in Peru, among all the nations of America, and by the chosen people, was always regarded as the most expressive symbol of God. The Divinity became sensible to them in this globe, which animates the world, and every where produces a happy fruitfulness. The sun was so much the hieroglyphic symbol of divinity among all nations, that all the names given to the gods of paganism, are referred to the sun. This was the first of the works of God, which attracted the attention of men, and in which they were naturally led to honor their sovereign master. The chosen people turned toward the rising sun to address their prayers to the Highest. Even the Scripture makes

---

\* Poetry of the Arts, by J. F. Sobry, p. 36.

use of the expression, that God has placed his tabernacle in that body.

How should nations so different from each other in their characters, so widely opposite in their modes of thinking, who, in things the most necessary to life, have conceived ideas so entirely at variance, how should they yet have been able to agree on the existence of a Supreme Being, and on a religious worship, if the Author of the universe had not graven the sense of these things in the hearts of all men ; if God had not impressed them upon the organization of the human race ?

Notwithstanding these undeniable proofs of the universality of the belief in God, and of the tendency to a religious worship, we still meet with men, who deny, that these sentiments are innate in the human species. There are, say they, nations in which we discover not the least trace of religion, nor the least trace of an idea relative to a Divinity.

I will not contest the possibility of the fact. Climate and the concurrence of other circumstances may impede the development of the cerebral part, by means of which the Creator has willed to reveal himself to the human race, just as climate and other influences may favor the development of the same organ. In Egypt, the cradle of so many religious sects, this organ had received a high degree of development, and of activity ; the contrary occurs among the Caribs, the Hottentots, &c. If there existed a people, whose organization was altogether defective in this respect, it would be as little susceptible of religious ideas and feelings, as any inferior animal. Such a diminution of any organ whatever would involve the same result in regard to its function. These are actually partial imbecilities.

But I know no people that is in this situation. Some travellers, seeing among certain nations, neither temples, nor altars, nor idols, nor any religious worship, have concluded, that the mind of these men did

not go farther than their monuments, and have pronounced too lightly, that they lived like brutes, and rendered no divine homage to any thing visible or invisible. We know that we find nearly the same customs in regard to divine worship, not only in the island of Crete, in the isles of the Archipelago, in Phrygia, in Thrace, in Asia Minor, but also in Colchis, in Bactria, as far as the Caspian gates and the Indies, which were, for the ancients, the farthest limits of the known world. We know also, that the Caribs have their great spirit Chemi, that the Hottentots and the Pampoux pay homage to the gods Fetiches. It is therefore certain, that the sense of the existence of a God, and of the need of a religious worship, has always been an attribute of all nations.

It is still objected, that ideas relative to God and religion, never arise among the deaf and dumb; and hence it is concluded, that there is not in man any natural disposition to these ideas.

But can it be believed, that the man of the most cultivated mind could arrive at those ideas of God and religion, which we have, if he had not been brought up in these ideas? The faith of sectarians is the work of education, of arbitrary instruction, and the ideas, which the philosopher forms of God, are the fruit of the most elevated abstractions. We cannot expect either the one or the other from a deaf and dumb man, whose education cannot have been directed towards this point; but from what we see all rude people do, we might divine what the deaf and dumb would do, if living together in tribes; for, the want of hearing does not prevent the deaf and dumb from forming to themselves, the same idea of the external world, which other men form of it, and from drawing the same deductions from the events, which pass under their eyes.

I have presented the successive developments, the shades and the modifications of the religious sentiment and of the idea of a divinity, in an inverse order



from that which is adopted by most authors; it is ordinarily supposed, that men, uncertain as to the nature of the powers, the secret influence of which they feel every moment, at first attributed these powers to animate bodies, to Fetiches, for example, and afterwards to living creatures. It could only be after they had attained a certain degree of culture and civilization, that they would rise to the adoration of beings. Afterwards, in this supposition, they adopted tutelary gods for each individual, villages, cities, and even for rivers and forests; and, after many efforts and combinations, they ended by conceiving the abstract metaphysical idea of an independent intelligence, of a God, the sole creator and master of the universe.

The order in which I have explained the progress of nations, in regard to religious ideas and sentiments, appears to me more conformable to tradition and reason. Experience teaches us, that in all ages, just ideas on the nature of the Divinity have degenerated into superstition and idolatry. The Hebrews knew Jehovah; but, notwithstanding the prohibitions of God, their inclination for idolatry was such, that they always relapsed into it. They could not abandon the great veneration they had like other nations for mountains, high places, and woods.

Since the Christian era, and the solemn proclamation of a true God, they have not been able to limit the worship to the Most High alone; they must still have secondary divinities, they still need images, relics, amulets, tutelary angels, saints, so many beings in whom they suppose a particular power, and whom they invoke in the confidence of a special protection.

In other respects, whatever hypothesis we adopt, it will always be difficult to keep clear of the obstacles, which oppose themselves to the direct proof of the advance, which nature has led mankind to make, towards his most important interests.

Whatever opinion we adopt, it still follows, that men have always instinctively recognised superior

beings, either beneficent or malicious. Under whatever form they have represented these powers, it is always the idea more or less obscure, more or less refined, of a superior being, which constitutes the basis of all creeds, and of all forms of worship, even the most absurd. Men were not long content to adore their household gods; they devoted temples and altars to them. "The first edifices," says M. Sobry, "which social order demands, are temples. Men wish to assemble, to render to God a service which consoles, unites, reconciles, and improves them. It is a duty, a want, a necessity. All ages, nations, and places, are subjected to this sacred custom, as ancient as the world, as widely diffused as the human race."

Now, it is not difficult to conceive, why it is with the belief in God, and with religious worship, as it is with all the qualities and faculties, which have been given to man by means of his organization. No one has invented the propensity to physical love, the love of offspring, attachment; men will never think of seeking in the records of history, the first who gave combat to one of his fellow-men, the first who made war, and who created the spirit of domination to raise himself to the head of a tribe or nation. No one has the glory of having invented painting, music, calculation, the mechanic arts, eloquence, poetry. So there is no one, neither legislator nor conqueror, who can be quoted as the first author of a religion, before whom it can be shown, that there was not any received religion. There was one before Numa, among the Romans. Moses, whose writings are anterior to any other work we have, shows, evidently, a religion coeval with the creation. If we read his books, we shall there see a religion formed among all the nations of which he speaks, particularly among the Egyptians and Canaanites; we shall see a religion already changed and corrupted among these ancient nations. What was the golden calf, if not the symbol of Isis, and one of those monstrous divinities of Egypt, already idolatrous?

Even in the time of Abraham, Chaldea was infected with idolatry. Religion being natural to men, it should be coeval and coexistent; and I repeat it, the idea of God is too sublime for man to attain by reasoning, if it were not inherent in his organization.

But some timorous devotees are alarmed by the assertion, that there is an innate disposition to religious ideas; because, say they, to seek within man the source of religious ideas, is to render revelation superfluous.

If God had resolved to reveal a peculiar religion, man should be made susceptible of receiving it by means of a natural disposition. Let one try all imaginable means of giving to an idiot ideas of God and religion, it is wishing to make of a brute an architect or a poet; the natural disposition, the susceptibility is wanting in both. Thus the seed of the sublime lessons of revelation had fallen upon stony ground, if man had not been rendered susceptible of profiting by the dispositions, which the Creator has given him. Revelation has guided his steps in the way, where his natural tendency to idolatry was bewildering him in darkness; it has purified and fixed the idea, which he formed to himself of God and his duties. Thus, then, the natural tendency of men to religious ideas, not only is not in opposition with revealed religion, but revelation would have been absolutely impossible, if the human race had not been prepared for it by means of its organization.

It is remarkable, that even those, who derive every religious idea from the personal intercourse of God with the first men and with Moses, make use, as by instinct, of the same expressions which Seneca and Cicero employed, to account for the universality of the belief in God. They all say, that this sentiment is engraven in the heart of all men, the most ferocious as well as the most humane.

This hypothesis explains how uniformity, in the fables relative to the existence of God and to certain

moral principles, and uniformity of rights, indicative of the same or similar principles, is found among men, in spite of partial changes introduced by different nations.

On the same supposition, it is still easy to conceive how religious ideas must have passed from generation to generation, as a heritage common to all.

As this organ coexists with other organs, likewise very active, devotion combines itself, in different ways, with the qualities or faculties, which result from them. The devout warrior, as Gustavus Adolphus, and the bloody Suwarrow, will invoke God before battle, to obtain victory from him, and will urge his soldiers to prayer. The cruel devotee, as Louis XI., Philip II., and others, will prove his pious zeal by arming the inquisition, by making auto-da-fés, and by performing with his own hands, the duties of the executioner. The devout artist, as Philip Champagne, will scrupulously avoid all that is licentious, and will represent only sacred subjects. The devout philosopher and naturalist, as Newton, Bonnet, Kleinjogg, and Clarke, will every where see in nature the finger of God, and in every thing render honor to the Creator, or even like Malebranche, will derive all our ideas from God, and will maintain, that we see God in all. The devout poet, as Milton and Klopstock, will sing the mysteries of religion.

I know a devout libertine, who pays public women by giving them prayer books. In this man the organ of devotion and that of propagation, are both greatly developed.

These combinations are infinitely various, for the organ of devotion as well as for all the rest; in health as well as in mania.

As all propensities may become the source of evil, so the most elevated propensity of the human race, is not altogether exempt from every inconvenience. If men are limited in their capacities, they cling to objects of veneration of their own creation, and to which they attribute a supernatural power. A con-



stant phenomenon, observed in all nations, proves that this tendency too often degenerates at the expense of the moral sense. Every where and in all sects of religion, men consider themselves much more obliged to fulfil the duties, they impose on themselves towards the idols of their imaginations, towards Fetiches, &c., than to meet the obligations of pure morality. A man may be on his knees before an image, be the slave of blind fanaticism, and endure penances as painful as ridiculous, while he makes no scruple of infringing the laws of society and of nature. Who has not seen that, where the ministers of religion entertain the people only with mysteries and dogmas, there intolerance, fraud, perjury, theft, murder, rape, incest, &c., are committed with deplorable indifference. One would rather lose his life, than break the vow of a certain abstinence.

The mind of the people is not sufficiently exercised to be able to embrace sentiments and ideas of a different nature. Once imbued with sterile dogmas, it is entirely devoted to them ; it is more strongly impressed by them, than by precepts drawn from social life. In the first case, he supposes himself connected to omnipotent beings by mysterious and invisible forces ; in the second, to human laws alone, the strict observance of which often demands a resolute self-denial and a repression of inclinations, the most dear and the most imperative. Preach up maceration, abstinences, fanaticism, mortifications, mysteries, &c., and the crowd will follow you ; but exact a severe morality in action, and you will be abandoned. It costs much more to be virtuous, than to be devout.

### *Religious Propensity in Mania.*

“Nothing is more common in hospitals,” says M. Pinel, “than cases of alienation produced by too exalted a devotion, scruples carried to fatal excess, or religious terrors.”

As this species of mania often occurs without there being any lesion of the other qualities or faculties, physicians ought long since to have concluded, that it belongs to the lesion of a peculiar cerebral part.

In the hospital of Amsterdam we saw a madman who was tormented with the idea, that, contrary to his will, he was forced to sin, and that he could not be saved. He has the organ of devotion greatly developed.

I have spoken elsewhere of an ecclesiastic, who despaired of his salvation. Another madman also had the idea, that he was condemned to eternal fires. The organ of devotion was greatly developed in both.

A female was brought to me, named Elizabeth Lindemann. I saw, at the first glance, that she had the organ of devotion unusually developed. She stood upright before me, raising from time to time her eyes to heaven, and testifying, in all her gestures, sadness and anguish. From her youth she had devoted herself excessively to prayer; for some time past she had been subject to convulsions, and maintains that she was possessed: the devil, she said, entered into her heart through her mouth, and tried to draw her into hell.

“A young man, at the epoch of the revolution, was astounded at the overthrow of the catholic worship, in France, and, overcome by religious feelings, he became a maniac and after the usual treatment at Hôtel Dieu, was transported to Bicêtre. Nothing can equal his gloomy misanthropy; he speaks only of the torments of the other life, and thinks that, in order to escape them, he must imitate the abstinences and the macerations of the ancient anchorites; thenceforth he refused all nourishment, and towards the fourth day of this invincible resolution, his state of languor induced fears for his life. Friendly remonstrances, pressing invitations, all are in vain; he rejects with harshness the soup which is served him, and even throws off the straw from his couch, to rest on the board.”  
(*Pinel*, p. 207, &c.)

“A madman of mild character unceasingly invokes his good guardian angel, or some one of the apostles, and is satisfied with nothing but macerations, fasting, and prayer. I was fond of conversing with a devout madman, who, like the ancient disciples of Zoroaster, rendered peculiar worship to the sun, prostrated himself religiously before this body at its rising, and consecrated to it, during the day, his actions, his pleasures, and his pains.” (*Pinel*, 118.)

In the collection of M. Esquirol, I have seen the casts of the heads of three persons attacked with religious mania. The organ of the religious sentiments is extremely developed in all the three. I have quoted analogous examples when speaking of the organs of murder and of poetry. If M. Esquirol continues to take casts of the heads of the insane and to preserve their crania, he will not fail to be one of the most zealous and most learned followers of organology.

I knew a peasant named Michel Schayer, and his sister; both were subject to periodical attacks of religious mania. The organ of devotion is unusually developed in both.

As, in health, this organ performs different parts, as it coexists with such or such other very active organs; so, likewise, in the state of disease, these different associations produce different species of pious mania.

“We remark a singular gradation,” says M. Pinel, “in the moral affections of young melancholic subjects, endowed with an ardent temperament; they usually run into the most exalted piety, and address to heaven the most fervent prayers, to combat the propensities of nature, and to come out victorious from this painful struggle.

“A young girl of sixteen, brought up in rigid principles, is placed with an artisan to learn embroidery; she there first receives the attentions of a young man of the same age, and finds herself exposed to all his fascination; the sentiments of piety, which she owes to her education, awaken in all their force, and there

is established a sort of internal struggle with the affections of the heart. Melancholy succeeds with all its fears and its perplexities; she can no longer eat or sleep, and a furious delirium manifests itself. Conducted to the hospital, and given up, alternately, to convulsive movements and to all the estrangements of reason she seems assailed by the most incoherent ideas; and often uttering inarticulate sounds and broken phrases, talks of God and of temptation.

“A waiting maid, from her youth lively and passionate, at the age of thirty years experienced all the development of an ardent temperament, though otherwise very prudent and very pious; and there arose a kind of painful struggle between the propensities of the heart, and the severe principles, which she had for a long time observed. These internal combats, and the alarms of a timid conscience, plunged her sometimes into despair, and made her seek for means of destroying herself, such as taking poison or throwing herself from a window. In her extreme perplexity, she had recourse to an enlightened and compassionate confessor, who sought to restore her courage, and often repeated to her, that she must attach herself to God, in order to regain her peace of mind. ‘But I feel myself,’ answered the girl with simplicity, ‘inclined rather to the creature than the creator, and that is precisely, what causes my torment.’ The good priest persevered, addressed to her consoling language, and urged her to *await with resignation the triumphs of grace, after the example of many saints and even of a great apostle*. Thus, far from inspiring her with fears in regard to the future, he sought to bring back calmness into this agitated soul, and to oppose the best remedy for the passions, patience and time; but disquietude and prolonged watching ended by producing a mental alienation, which was treated at Salpêtrière according to the same moral principles, and which was of short duration.” (*Pinel*, 270.)

It is not at all rare, that the organ of devotion and



that of physical love, are found injured together, and hence the reason why cases of mania, compounded of erotic and religious insanity, are so frequent.

Religious mania may become exceedingly dangerous, when a propensity to murder is joined to it.

I have seen a man, in whom the instinct of murder and that of devotion, were both extremely developed; he had already had two violent attacks of mania, in which he threatened to murder all who did not profess the catholic religion, though he himself was a protestant.

Sometimes the propensity to suicide is joined to religious mania. A man of Weil in Suabia, well constituted, had been very religious from his infancy; for some years he had given himself up, more and more, to religious fanaticism, and ended by experiencing terrible agony. He was tormented with an idea, that he could not be saved, because he was possessed of the devil. In spite of all resistance to these melancholy ideas, which beset him, he finally fell a victim to his propensity to suicide; the first attempt he made to destroy himself was unsuccessful, but he finally ended by cutting his throat. This man was reasonable in every other respect; in examining his head, I found the organ of devotion and that of circumspection, extremely developed.

A huzzar, of whom I have spoken in connexion with benevolence, and who had always been of a very good and humane disposition, fell into a state of derangement. In this state he manifested a desire to effect the happiness of the whole human race, and in all he said and did, he constantly called to witness the holy Trinity.

Very frequently the lesion of the organ of devotion is accompanied with a lesion of the organ of pride. The wife of a tailor passed a part of the day in churches with her well dressed children, treated her very complaisant husband with the greatest disdain, and ended by demanding, that he should serve her on his

knees, and see in her a privileged soul, endowed with supernatural powers. Another woman of high birth, whose husband had fallen into misfortune, thought to find consolation, first in long meditations and very fervent prayers, then in her ecstasies of delight, in which she believed herself raised to the bosom of the divinity, and which were the prelude of decided insanity.

M. Pinel says of these madmen, that, "We cannot deny certain difficulties in dissipating this sort of illusion, which belongs to a very exalted devotion or to fanaticism. How can we bring back to sanity a madman, puffed up with pride, who thinks only of his high destinies, who considers himself a privileged being, an envoy of the most high, a prophet, or even a divinity? What arguments can counterbalance the effect of mystic visions and revelations, of the truth of which the madman is angry, that others can form the least doubt?"

It is then shown by the state of disease, as well as by the state of health, that the sense of the existence of a superior being, and the propensity to religious worship, are fundamental qualities of the human race, and that consequently, they must belong to a peculiar cerebral organ.

Let us still add some proof as to the external appearance of this noble organ.

*External Appearance of the Organ of the Sense of the Existence of a God, and of the propensity to Religious Worship. Continuation.*

If we consider the busts and the portraits of men who, in all ages, and in all sects, have been most ardently attached to religious ideas, we find in them the organization, which I have pointed out in the history of the discovery of this organ. We constantly find in them, that the great development of the cere-

bral parts xxvii, Pl. viii. ix. xi. xii. makes the posterior mean part of the superior half of the frontal, project considerably. Of the great number of examples that are known, I will cite only the following: Constantine, Pl. xciv. fig. 1. Antoninus Pius, Pl. xciii. fig. 1. Marcus Aurelius, St. John, Chrysostome, St. Ambrosius, St. Athanasius, St. Stephen I., king of Hungary, Pl. xciv. fig. 2. St. Brun, St. Bernard, St. Dominic, Aubusson, St. Ignatius de Loyola, Pl. xciii. fig. 6. Charron, St. Francis de Sales, Pl. lxxxvii. fig. 5. Gustavus Adolphus, Pl. xciv. fig. 4. Charles I. of England, Louis XIII. Pl. xciv. fig. 5. Bourdaloue, Malebranche, Antonine Arnauld, Benoit Joseph Labre, Pl. xciv. fig. 6. Joseph of Paris, Pl. xciv. fig. 7. The philosophers and naturalists, Newton, Montagne, Pl. xciv. fig. 9. Bonnet, Kleinjogg, Clarke, Lavater, Sailer, Pl. xciv. fig. 10. The poets, Milton, Pl. lxxxiv. fig. 2, and Klopstock. The pious artist, Philippe Champagne, Pl. xciv. fig. 3.

This organ is very remarkable on the head of the priest, who gives the communion to St. Jerome, when dying; a painting of Domenichino, exhibited in the gallery of the museum.

The small cranium, Pl. l. is of a very devout woman, very superstitious, a fortune-teller, who favored two lovers at the same time. The cranium, Pl. xxx. is of an ex-jesuit, an excellent preacher, who unites the organ of devotion with that of comparative perspicacity. The author of *Indifference in Religion*, the Abbe F. de la Mennais, Pl. xcv. fig. 2. Combine a great development of the organ of devotion and of that of the sense of localities, and you will have the missionary James Leonard Perocheau, Pl. xcv. fig. 3.

How much all these elevated heads differ from that of the atheist Spinoza, flattened on the top! Pl. xciv. fig. 8.

I have intentionally chosen men, whose occupation and duties varied greatly. We see, that it is sufficient

to have the part of the brain referred to, much developed, in order that they may devote themselves to religious sentiments, whatever may be their habits in other respects.

We shall no longer be supposed to see the same conformation in the heads of the Christ of Raphael. In the same heads, the posterior parts are flattened, and consequently, the organs of the qualities common to man and to animals, are very inactive. The organs, on the contrary, placed under the median line of the anterior superior and superior posterior parts of the frontal bone, are greatly developed; whence it follows that these heads convey the expression of sagacity and of penetration, of benevolence and of the sense of Divinity; in fine, of the source of the purest morality.

But, has this divine form been invented, or can we presume, that it is the faithful copy of the original?

It is possible, that artists may have imitated the form of the heads of the most virtuous, the most just, most benevolent men, in order to give a character to the head of Christ, which they wished to represent. In this case, the observation of these artists would confirm mine. Yet this course supposes some idea of organology, or, at least, more circumspection than appears to me probable.

It is more probable, that the general form, at least, of the head of Christ, has been transmitted to us. St. Luke was a painter, and, in this character, why should he not have wished to preserve to us the features of his master? It is certain, that this form of the head of Christ is one of very high antiquity; we find it in mosaics, and in the most ancient paintings. The Gnostics of the second century possessed images of Jesus and of St. Paul; so that neither Raphael nor any other more ancient artist, invented this admirable configuration of the head of Christ. Pl. xcv. fig. 1.

When devotion is found in men endowed, in other



respects, with qualities different from it, or which are even diametrically opposed to it, we usually charge such men with hypocrisy, or at least, with sinister motives. We are slow in believing that Gustavus Adolphus, Pl. xciv. fig. 4, and Suwarrow, could, in good faith, on the eve of a battle, have performed themselves, and imposed on their soldiers, the most severe religious exercises, prayers, fasts, &c., either to obtain a general absolution, or to gain a victory.

Gabrino Rienzi was generally accused of being an impostor, a hypocrite, and of making religion serve his purposes, by putting in operation revelations and visions, to authorize his ambition and his cruelty. The inspection of his portrait, Pl. xciii. fig. 6, explains all the contrasts of his conduct.

Now, that we understand how the most revolting contradictions may exist in the same individual, we shall no longer be astonished to see the devotees Lewis XI., Pl. xciv. fig. 11, and Philip II., Pl. xciv. fig. 12, commit all acts of cruelty, make auto-da-fés and perform, with their own hands, the office of the executioner. It is organology alone, which gives the most reasonable explanation of the horrors of the inquisition.

The life of the conqueror Cromwell is an enigma for most of his biographers. Was his devotion real? Was it a calculation of hypocrisy? The following is the manner in which M. Villemain explains himself, in speaking of the mysticism of Cromwell.

“That official mysticism, so to speak, employed by Cromwell, in the communication he addressed to Parliament, is found at the same time in his private letters. Must we, on this ground, suppose as Voltaire does, that Cromwell was for a long time, sincerely a fanatic, and that he became a hypocrite in proportion as his mind was refined by the progress of his power? Or, must we believe that Cromwell, like Mahomet, made his first dupes in his own family, and commenced by the delusion of his own friends, the deception which he wished to extend to those about him?

“ Besides, here are some of the religious letters which Cromwell, when already powerful and celebrated, wrote to his family. The first, dated 1646, is addressed to his daughter Bridges :

“ ‘ DEAR DAUGHTER,

“ ‘ Your sister Claypole is tormented by some unquiet thoughts (I trust in the mercy of the Lord) she sees her own vanity and the carnal disposition of her mind ; she laments it, and seeks him who alone can purify her. Thus to seek, is to belong to the happiest sect, to that which finds, as every humble and faithful seeker will find. *Happy seeker ! Happy finder !* Who has ever tasted how sweet the Lord is, without experiencing some returns of self-love and of weakness ? Who has ever tasted the sweetness of God, and can become less zealous in his desire and less anxious to obtain the full enjoyment of the Lord ? My dear friend, always seek the Lord ; let neither your husband nor any thing in the world, weaken your affections for Jesus Christ. I hope that he will be for you an occasion of exciting them the more, that which makes thy husband most worthy of thy love, is that he bears in him the image of Jesus Christ. There fix your eyes upon that, think it is what you must love above all things, and all things for that,’ &c.

“ Another letter of Cromwell to his wife, presents the same character, and is not less curious :

“ ‘ MY DEAREST,

“ ‘ It rejoices me to know, that thy soul prospers, and that the Lord increases more and more his favors to thee. The great good, which thy soul may desire, is that the Lord may shed on thee the light of his protection, which is better than life,’ &c.

“ I submit to the reader these ascetic letters which seem to me more worthy of madame Guyon than of a conqueror : if there is not in them a cant and an intention of deceiving, which is powerful, only when it

is constant, we may conclude, that Cromwell was an honest man. Independently of the various proofs which I have opposed to this opinion, and of the testimony of the enemies of Cromwell, who, whether fanatic or not, accused him of hypocrisy, I can cite the authority of an impartial and indifferent witness. Debordeaux, the ambassador of France, wrote on the subject of the zeal, which Cromwell manifested for protestanism: 'The reports which they spread of the general, are not true: he affects great piety, but by a peculiar communication with the holy spirit; he is not so weak, as to allow himself to be led away by flattery. I know that he laughed about this with the ambassador of Portugal.''' (*Thurlow's State Papers*, vol. i. p. 256.)

M. Villemain says, in a note of the 11th book of his *History of Cromwell*:

"We find in a letter, written after the death of Cromwell, by a man who was intimate with him, some details respecting his character and person, which serve to make known, what he was, and what he appeared. The most curious trait in this picture shows apparent tenderness of feeling, often remarked in the life of Cromwell, and which makes Whitelock in his memoirs say, that the protector was a very good man; *a kind of sensibility, sometimes altogether physical, which does not reach the soul, and which is compatible in certain men with the cool blooded contemplation of the greatest cruelties.* The following are the terms of this letter: 'The protector was of a powerful and robust constitution; his height was under six feet, (two inches I believe,) *his head so large, that you would believe it must contain a vast treasure of intellectual faculties; his temper excessively inflammable;* but this flame fell partly of itself, or was soon extinguished by the moral qualities of the protector. He was, by nature, compassionate to beings in suffering even to the degree of weakness. Although God had given him a heart, in which there was little

room for the idea of fear, except that which he himself inspired, yet he carried to excess his tenderness for those who suffered; he lived and died in perfect union with God, as judicious persons, who were near him, have observed.'” (*Thurlow's State Paper*, vol. i. p. 766.)

In fact, the form of the head of this extraordinary man, Pl. xcv. fig. 4, proves in an indisputable manner, that this devotion, as well as his other qualities are in harmony with his organization. In general I do not think, that sovereigns, especially when they are powerful, take great pains to appear different from what they really are; and we shall never fail to find the explanation of their most singular contrasts, and their apparent hypocrisy, in a peculiar combination of organs, developing themselves simultaneously with great activity.

We see how essential it is, that artists should renounce their mannerism in taking the portraits of the men, whom they wish to hand down to posterity; since they can furnish, by an exact resemblance, the means of ascertaining the true motives of their actions.

### *Proofs of the Existence of God, taken from Organology.*

After all I have said, it can no longer be doubted, that the human race is endowed with an organ, by means of which it acknowledges and adores a God of the universe; this is the noblest prerogative, which man possesses above the brutes. Man was to be the only really free creature of the earth; consequently man alone was to be capable of motives of action of a high order: he alone was to have the faculty of weighing and appreciating moral motives, before deciding upon actions prompted by his propensities; moral good and moral evil have an existence for him alone: and, as his own strength is not always sufficient



to control the disorderly workings of his desires ; as he too easily finds means to elude the laws of society ; and, in fine, as there exists no check for those, whom their power or even the social compact has placed beyond all responsibility, it was necessary, that eternal Providence should place another powerful law in man himself ; it is necessary for the human race, that each individual should find and fear in himself a secret censor, a censor, which supposes a supreme judge, from whom it is impossible to escape. Let us apply organology to this innate sentiment, and let us take possession of it, as of a new proof of the existence of God.

All our senses are in relation with certain external objects ; of what use is the mouth, the sense of taste, of hearing, of smell, of sight, if, in the external world there did not exist objects of touch, molecules, emanations, vibrations, and light, fit to produce savors, odors, tones, and visions ? The natural history of the five senses would therefore be incomplete, if we abstracted external objects, and the reciprocal action of the two on each other.

In the same way, all the propensities and faculties of man and animals, are predicated on external objects, with which nature has established an immediate relation. The male and the female are the objects of the instinct of propagation ; young ones and children satisfy the love of offspring ; the instinct of self-defence combats the enemies of one's preservation ; the carnivorous instinct every where meets animals to prey upon ; the imperious man finds individuals and nations to subjugate ; the organs of place, painting, music, calculation, mechanics, are exercised on the laws and the relations of space, colors, tones, &c.

Thus all these propensities and faculties, and their organs, would be without object, if there were no external objects, on which they might operate. Nature would have trifled with man and with animals, if, in giving them instincts, propensities, faculties, she had

refused them external objects to satisfy them. Their state, at the first moment of their existence, would be a state of privation, of painful inconsistency ; the second would be that of their death. It is, therefore, certain, that nature has created no sense, no organ, without having prepared for it beforehand, in the external world, the object of its function.

Now ; it is certain, that, in all ages and all countries on the earth, the organization of man has led him to the knowledge of a Supreme Being : it is certain, that, in all ages and all countries, man feels his dependence on a first cause ; that he feels the necessity of having recourse to a God, and of rendering homage to Him. Who would dare to think, that this single sentiment, this single organ was deprived of its object in the external world ? No ; nature cannot so far wrong men in their most important interest ! There is a God ; because there exists an organ for knowing and adoring Him ! \*

## XXVII. *Firmness, Constancy, Perseverance, Obstinacy.*

The character of man depends much more on his feelings, than on his faculties. The feeble, undecided man, and the man of firm character, cannot know why the former wavers from one project to another, nor the man of firmness, why he maintains strongly the ground

---

\* If certain philosophers would consider well, what I have just said on the innate feeling of the existence of a Supreme Being, and on the natural propensity to religious worship, they would see the necessity of modifying entirely their specious arguments, which they support by historical notions not less rash in favor of atheism. According to their view, would they not also find means to explain the origin of the propensities to propagation and to murder, of the love of offspring, of the sense of property and of pride, of the talent of music, calculation, architecture, poetry, in general of all the propensities and faculties ? Such illusions are inevitable whenever, in order to explain the phenomena of living beings, we disregard their organization, and their internal powers.

he has taken. Cicero, that orator and philosopher, always uncertain, and wanting firmness, neither knew how to adopt an opinion promptly, nor to maintain firmly that which he had adopted. As he allowed himself to be intoxicated by success, so was he liable to be cast down by reverses, and he passed rapidly from the excess of confidence, to abject despair.

Cato of Utica, on the contrary, discovered, from his youth, that inflexibility of character, which he exhibited through the whole course of his life. Pompedius jestingly begged of young Cato his recommendation of him to his uncle. The child kept silence, and manifested by a look and an air of discontent, that he would not do what was asked of him. Pompedius insisted, and wishing to urge the child to his purpose, took him in his arms, and carried him to the window, threatening to let him fall if he persevered in his refusal; but fear had no more effect on him than prayers. — He afterwards killed himself to escape submission to his enemy.

Children daily offer us examples both of firmness and of softness of character. Some are self-willed and obstinate; *when they have set their hearts upon a thing*, nothing can turn them from it. Others are supple, have no will of their own, cannot say no; such are the first traces of their future character; and in neither case has reflection the least influence on their manner of action.

Properly speaking, firmness is neither a propensity, nor a faculty; it is a mode of being, which gives to man a peculiar impress, which is called character; he, who wants it, is the sport of external circumstances, and of the impressions which he receives; he is a weather-cock turned by every gale. To-day he cries huzza for the republic, to-morrow, huzza for the tyrant. He lends faith and homage to every kind of idol. Constant only in his inconstancy, he quits, with astonishing rapidity, one standard for another; he is the man of all parties, and consequently the object of contempt to all.

The immoveable man is he, who is endowed with firmness to the highest degree. As he is unchangeable in his mode of viewing objects, we may calculate beforehand what will be his conduct, if a given event takes place. He is a man in whom we can have confidence; he undertakes difficult things in preference: difficulties and obstacles, which would deter feeble minds, are only encouragements which redouble his ardor. *Tu ne cede malis, sed contra audacior ito*, is his motto. He does what he considers his duty; example for him is nothing: it is as difficult to mislead as to correct him; menaces and dangers improve his firmness into audacity; he repeats with L'Hôpital; *si fractus illabatur orbis, impavidum ferient ruinæ*.

Firmness and obstinacy flow from the same source. The weakheaded man, the child, are obstinate, intractable; the reasonable man is constant, immoveable, persevering, firm. *Tenax propositi vir*.

### *Seat and External Appearance of the Organ of Firmness.*

This organ is formed by convolutions XIII. Pl. VIII. IX. XI. XII. placed immediately on the top of the head under the two superior anterior angles of the parietal bones, at the point, where these meet the superior posterior edges of the frontal. When these convolutions have a considerable development, they give to the crown of the head a spherical protuberance. The crown of the head is prominent in persons endowed with firmness; while it is level or depressed in the feeble and irresolute.

Lavater himself, as I learned after my ideas were already fixed in this respect, perceived by means of the numerous *silhouettes*, which he had collected, that the form of the head I have now pointed out, is proper to persons of a firm character.

Nothing is more easy than to multiply observations



on this subject. There is no family, no school, no society, which does not furnish the opportunity. The cranium Pl. xcvi. is that of the famous painter Unterberger ; this man continued all his life immoveable in what he undertook ; he undertook only things difficult of execution, and which required many years to bring them to perfection ; though this disposition of mind by no means facilitated the means of providing for the wants of the numerous family, with which he was burdened. In this cranium, we see, on the summit the projecting elevation, of which I have just spoken, well marked.

This protuberance is much more remarkable in the cranium of a highway robber, extremely hardened in crime ; this wretch was long kept in a narrow prison to force him to declare his accomplices ; when it was seen, that this means was insufficient, recourse was had to blows with a stick ; this torture appeared too painful to him, and he strangled himself with his chain. After his death, I found the parietals disunited precisely in the place, where the organ of firmness is placed. Was this separation an effect of the violent strangulation ? Must we attribute it to the excessively energetic activity of the organ of firmness ? Is it an effect of chance ? Perhaps we shall have occasion to observe similar cases, which will aid us in resolving this question.

Dr. Spurzheim and myself saw in the house of correction, at Strasburg, a desperate robber, who, for a whole year, had pretended to be dumb ; this man had the organ of firmness extremely developed.

Firmness of character must not be confounded with perseverance in certain propensities ; as with the uninterrupted manifestation of certain faculties, which may exist in the most vacillating character.

How happens it, that certain persons, to procure enjoyment, are obliged to change every moment the object of their favorite propensities, while others are opposed to every kind of change ? Lodging, friends,

mistresses, every thing, in fine, is dearer to them, the longer they remain in their possession. There are persons who have a rage for building. Hardly is one of their plans executed, when they are again changing; to make changes is their occupation through the whole year. There are likewise men, who love the fair sex, and feel the desire to unite themselves to woman by indissoluble ties, and to anticipate happiness from such a union. But no sooner do they possess the object of their desires, than it loses, in their eyes, all the charms it possessed; the spell is broken; in vain do they change; with each change they only wander farther from the end they propose to themselves. Does this disposition depend on the want of firmness of character, or, on a defect of the principle of attachment, or rather, on a deficient development of both these qualities?

*Conclusion of the Exposition of the Organs, and of their Functions.*

If I had treated of all the fundamental faculties, and of their organs, I should have made known all the instincts, propensities, and faculties of man and of animals — I might say, thus far extends the province of man, and no farther. But, probably, those, who will follow me in the career which I have opened, will still discover some fundamental powers, and some organs, which have escaped my researches. Yet it is to be presumed, that they will never discover as great a number, as some philosophers seem to believe to exist. We must be cautious of admitting a particular organ for each modification of a quality or faculty. Nor must we deduce from a particular organ the qualities or faculties, which are only the result of the simultaneous actions of many organs. Now; if we reflect on the number of possible combinations, which may result from twenty-seven to thirty fundamental

qualities or faculties, from the reciprocal action of as many organs, we shall no longer be astonished at the infinite number of varieties met with in the characters of men. How many different combinations result from ten figures, from twenty-four letters ! How many different faces result from the different combinations of the small number of parts, which compose the human face ! How many shades, colors, and concords result from the combination of the small number of primitive colors and fundamental tones !

I have constantly adopted the principle of advancing nothing, which I could not either rigorously prove, or, at least, render very probable by strong arguments ; it is for this reason, that, for the qualities and faculties, of which I maintain the existence, I have confined myself to that degree of activity, to which I could discover them and observe their manifestation. I am not ignorant, that it would have been more philosophical to bring back always to their fundamental forces, the qualities or faculties, which I have been able to detect only in their exalted action ; but, I have preferred to leave something for those to do who will come after me, rather than to put them under the necessity of undoing, what I might have prematurely established.

Besides, the difficulty of determining the primitive forces, is perhaps only apparent. Though all individuals of the same species are endowed with the same qualities and faculties, all are not endowed with them to an eminent degree. All dogs are not attached to their master ; all are not courageous ; all have not the faculty of directing their course ; all bitches are not good mothers. Nevertheless, we say with truth, that all dogs possess the organs of attachment, of courage, of localities, of love of offspring. All have not an exquisite smell : can we therefore say, that dogs do not possess the faculty of scent ? So, likewise, all men, though essentially furnished with

the same moral qualities, and the same intellectual faculties, are not geniuses in any respect. Most are limited to the simple disposition, to the capacity, to a moderate exercise of human power. It is given to only few individuals to be original. The Homers, the Ciceros, the Euclids, the Raphaels, the Michael Angelos, Titians, Mozarts, Canovas, St. Vincent de Pauls, &c., are rare ; but every body is sensible to the charms of poetry, eloquence, painting, architecture, music, acts of beneficence. Thus, every body, with few exceptions, has the capacity to enjoy the productions of individuals, more happily organized. Why should not a person have the organs of poetry, of sculpture, of music, although unable to compose an Iliad, a Saint Madeleine, *une Flute enchantée* ! These reflections, applied to organs, whose fundamental function seems not to be well determined, will perhaps prevent my successors from changing the denominations, which I have adopted conformably to the very energetic manifestation of a quality or a faculty.

There are presumptuous men, who think they can do every thing better than it has been done, and who say to me : " I doubt not, that there exists different organs in the brain ; I only doubt whether we ought to admit those, which you pretend to have discovered." I would urge these persons to publish their discoveries, as well as the proofs on which they rest them. If their ideas are more conformable to nature, their proofs more convincing than mine, I will receive them with the more eagerness, as I attach more importance to a doctrine of the functions of the brain, which should leave nothing to desire.

Others, again, make exceptions to my physiology of the brain, inasmuch as they pretend, that I admit too great a number of fundamental qualities, and faculties and organs. It is not astonishing, that from twenty-seven to thirty fundamental qualities, and as many organs, should appear much too numerous to philosophers, capable of deceiving themselves to the extent



of believing one, two, three, or at most six fundamental forces, sufficient to explain all the qualities and all the faculties of man.

When I commenced my researches, I was very far from knowing what I should discover. I had as little prepared myself to find a single fundamental power as to find twenty. Each of those, which I admit, is clothed with distinctive characters of fundamental qualities or faculties. Each one fulfils the following conditions announced at the commencement of the volume.

1st. That the organ is neither developed in the same time with the others, nor degrades itself simultaneously with them.

2d. That, in the same individual it is more or less developed than the other organs, and its functions takes place with more activity than that of the others.

3d. That when, in complete imbecility and in complete loss of mind, the function of this organ is alone in activity, this organ has alone acquired a certain degree of development.

4th. And that this organ alone remains in arrear in its development, in cases where its activity is alone more feeble, than that of the other qualities and faculties.

5th. That in mental diseases, the primitive force in question, may alone be injured or remain untouched, that is, that its organ may be singly injured, or be found singly untouched.

6th. That the fundamental function and its organ exist in certain species of animals, and are wanting in others.

7th. That often the same fundamental forces are found to exist in different degrees in the two sexes, and that, in this case, the organ of the quality or faculty has a degree of development differing in the two sexes.

These modifications certainly cannot be explained either by the aid of a single fundamental force, or of

three, or of five, or of six; and every hypothesis, which renders no reason for the daily phenomena which the state of health and the state of disease offer us, is necessarily false.

Now, as it is precisely these modifications, which constitute the character of a fundamental power, and as they are found, either wholly or in part, in all the moral qualities and intellectual faculties of which I have treated, I must necessarily receive them as so many fundamental powers.

All, that may seem incomplete to the reader, will be completed hereafter, when I shall treat of the philosophy of man.

---

CONFIRMATION OF THE TRUTH OF ORGANOLOGY, AND CONSEQUENCES WHICH FLOW FROM THIS DOCTRINE.

*Agreement between the prevalent Form of the Head and the moral and intellectual Character of Nations.*

The philosophers, who have hitherto made a collection of the crania of different nations, sought for characteristic signs, not only in the osseous box, which encloses the cerebral mass, but likewise in other bones of the cranium. They sought rather to find the marks by which they might distinguish the head of the negro, the Carib, the Iroquois, the Tongusian, the Samoïede, the Chinese, the Arab, Laplander, Kalmuck, than to discover the material or organic causes of the characters, by which these nations are distinguished. We see, by all that I have said in the preceding sections, that, in order to find the external signs of the difference of these characters, it is only necessary to study the osseous box of the brain.

In treating of each quality and of each individual faculty, I have pointed out for almost all, the influence which climate exercises on them. I may therefore

confine myself for the present, to presenting some general ideas.

It is certain, that different qualities and faculties characterize, in a particular manner, certain countries, and that there is a marked adaptation, as well for certain races of men, as for the energy of certain moral and intellectual powers. It is under the temperate zone, that man has attained the highest degree of perfection of which his nature is capable. Under the extremes of heat and cold, his activity is impaired. Under the one, he is dull and stupid, moderate in his pacific desires; under the other, he is violent in his affections, feeble in judgment, and given up to animal pleasure; under both, he manifests a mercenary soul.

“It is to the southern nations of Europe, both ancient and modern, that we are indebted for the invention and embellishment of that mythology and of those ancient traditions, which even now present the most fertile field for the imagination, and an inexhaustible source of poetical allusions. We owe to them the romances of chivalry, and those succeeding models of a more rational style, by which the imagination is excited, and elevated, and the spirit is purified.”

The north has been more fruitful in the productions of industry, and it is there, that the sciences have received their most valuable additions: the efforts of imagination and of feeling have been more successful and more common in the south. While the borders of the Baltic were made illustrious by the labors of Copernicus, Tycho Brahe, Kepler, those of the Mediterranean produced men of genius in all departments, and abounded in poets and historians, as well as in philosophers.

In the north, science is still confined to those departments, which furnish scope for the judgment and memory. Faithful details on public events, without much discernment in regard to their respective importance; the treaties and the claims of nations, the

genealogies of sovereigns, the dates of their birth ; these are the great objects, which the literature of the north has endeavoured religiously to preserve ; while it has allowed the faculties and feelings of the soul to remain neglected. The history of the human heart, the interesting memoirs furnished us by the free and natural incidents of private life, as well as the brilliant events of high office, the spirit of wit, the piercing shafts of satire, all the varieties of eloquence among the ancients and the moderns, are confined, almost without exception, to the latitudes of the fig and the grape.

The burning desires, the fiery passions, which are enkindled between the sexes in one climate, in another shrink into cold regard, or reciprocal pardon for mutual disgusts. One is struck by this difference, in crossing the Mediterranean, in ascending the Mississippi, in crossing the mountains of Caucasus, in passing the Alps and the Pyrenees to the Baltic Sea.

On the frontiers of Louisiana, woman governs by the double ascendancy of superstition and passion. Among the natives of Canada, she is a slave, and is valued only for her labors, for the domestic duties which are her lot.

The fires of love, the tortures of jealousy, which have so long reigned in the seraglios and harems of Asia and Africa, and which, in the south of Europe, have hardly been influenced by the difference in religion and of the civil establishments ; by a diminution of the heat of climate, and in higher latitudes, easily change into a momentary desire, which takes possession of the soul without enfeebling it, and leads it to acts of gallantry. Farther north, it is a spirit of gallantry, which occupies the mind and the imagination, more than the heart, which prefers intrigue to enjoyment, and substitutes affectation and vanity, for desire and feeling. In proportion as we leave the tropics, this passion degenerates more and more into a habit of domestic union, and cools to such a degree of insen-



sibility, that, if the two sexes had the liberty of choice, they would hardly prefer this kind of society." \*

The history of the human race forms an inexhaustible source of similar reflections. Researches of this nature will be more multiplied, and will have more importance, in proportion as men are more convinced, that intellectual operations depend on the animal organization.

As to the examination of heads in particular, I deem it my duty to recommend the following precautions.

To observe a small number of crania is usually thought sufficient, in order to be prepared to draw deductions from them; it would in fact be so, if the moral and intellectual character of all individuals composing a nation, were the same. According to my observations and those of Spurzheim, there is, in this respect, the greatest difference between man and man, even among nations to whom a decided national character is attributed with reason. Spurzheim saw at London twelve Chinese, and found them as different from each other as the Europeans. The resemblance between them existed only in the countenance, and especially in the position of the eyes. M. Diard gave me two crania found at Coulti, on the borders of the Ganges. If I except the organs of the love of offspring, and of the sense of property, which have acquired an equal degree of development, all the others offer striking distinctions. We see the same differences in negroes, though these resemble each other in the mouth and nose, especially when they come from the same district of country. Among three negroes, whom Dr. Spurzheim saw at London in the establishment for mutual instruction, was a young man, eighteen years of age, endowed with extraordinary talents and a very agreeable face; I have seen several negroes of both sexes, whose features were far from

---

\* Ferguson, Essay on the history of civil society, vol. I. p. 315, &c.

being disagreeable. I see the same form in individuals of different nations, so that it would be impossible to distinguish by that circumstance alone, whether a man was French, German, Italian, Spanish, or English. It is precisely for this reason, that we find individuals of all nations, who have precisely the same moral and intellectual character. We therefore pass a hasty judgment, when we think to discover the general character of a nation, in a small number of crania.

In order to discover this general character, we must have it in our power to study a great number of individuals, whole masses, the whole nation, if possible. With such facilities, it would be easy for the organologist to discover, in the structure of the head, the material cause of the character of a people. It is true, that, generally, the negro is inferior to the European in intellectual faculties; accordingly, in general, negroes have the head smaller, and a cerebral mass less than the inhabitants of Europe. It is true, generally, that the English and the French have less disposition for music than the Italians and the Germans: accordingly, the organ of tones is less developed in the former than in the latter. We may also explain, by comparing the forms of their heads, why the English and Germans are disposed to seek the connexion between cause and effect, while the French confine themselves to individual facts, and despise abstractions and generalizations, &c.

It is in this respect, that the study of the forms of national heads may be useful to organology: and, at this moment, one might make on this subject a very interesting work. It is of little consequence to the physiologist, that the general character of a nation depends on the influence of the climate, upon the kind of life, the habitual occupations, nourishment, the form of the government, religion, or on original race; for, in most cases, the question might be actually insolvable. It will often be easy to deny, that the climate exercises a predominant influence.

The history of all ages and all nations teaches us, that the most striking contrasts, both in regard to physical beauty and to the intellectual faculties, are found placed near each other. One nation will live thousands of years in one country without gaining civilization or the character of natives. On the other hand, we should sometimes be tempted to say, that the change of the form of government and of the religion has also changed the character of a nation; while in fact it is not changed; it is only compressed or has been temporarily modified. If you see a people to-day seized with religious fanaticism, to-morrow a prey to the passion for conquests, and the next exalted by the desire of liberty, finally, at all times, varying from moment to moment in its judgments and in its desires; if the same nation, which formerly was the cradle of the arts and sciences, now grovels in idleness and sensuality; avoid saying that its organization and its character have changed. It appears to be a part of the plan of nature, that sometimes one organ, sometimes another, should exercise supreme power over the same nations.

I subjoin some observations on the heads of the Papous, extracted from a memoir read to the academy of sciences by M. Gaimard, physician and naturalist of the expedition of discovery around the world, commended by Capt. Freycinet, and one of the compilers of the zoölogy of the great work, in the press, in relation to this expedition.

"We brought," says he, "from the island of Rawak six heads of the Papous, which we found on the threshold of the tomb of a chieftain. On our arrival at Paris, having submitted these heads to the examination of Dr. Gall, we have now the satisfaction to offer, with more confidence, such of our observations as will support the doctrine of this celebrated physiologist. At the first examination of the crania, M. Gall remarked in all an inequality, which he called *rachitic deformity*, and which led him to believe, that the men, to whom

it belonged, inhabited low and damp places. It was with surprise, we must say, that we confirmed the truth of so delicate an observation. In fact, most of the inhabitants of this Archipelago, living principally upon fish and shells, scarce ever leave the seaboard, which in these countries is so marshy, that one can in a manner sail in the woods. The inhabitants, whom necessity obliges to remain in such unhealthy places, endeavour to escape their influence by raising their houses on piles. They have probably learned by experience, that places constantly submerged, are less dangerous than those occasionally so, whence the custom which they follow of building their habitations above the waters of the sea.

“The heads of the Papous present a flattening of the anterior and posterior parts, and at the same time a widening of the face.

“The summit of the head is elevated, the parietal protuberances are prominent, the temporal very convex, and the coronal, at the place of the semicircular line of the temples, presents a remarkable prominence.

“The bones of the nose, almost vertical, flattened from before backwards, have little prominence; they are narrowed at their middle part and widened above and below. The form of the nose corresponds to this arrangement, which is still increased by the breadth of the rising apophyses of the superior maxillary bones, directed forward. These bones themselves are much broader than in the European race, which depending especially on the development of the malar apophysis, gives to the face the breadth, which is remarked in all these nations.

“The anterior opening of the nasal canals is very much widened at its inferior part; this widening is even more considerable than among the negroes.

“The malar bones are more directed forward, and the zygomatic apophyses are broader and more prominent.

“We observe, in one of the heads, the greater



breadth and depth of the maxillary and frontal sinuses, discovered by the fracture of the bones. The draughtsman, M. Chazel, has faithfully copied this accident, as well as the scar, made by a cutting instrument, which has altered the left parietal.

"The alveolar arch is of very remarkable thickness in the part corresponding to the molar teeth; the roof of the palate, more developed in the transverse diameter, is less extended from before backward.

"The anterior palatic opening is larger. Would not this disposition indicate a more considerable development of the naso-palatic ganglion and a more perfect organ of taste?

"One of these heads, which was not drawn, is irregular, offers in the two halves of the cranial box a considerable difference. The flattening, instead of being in the direction of the anterior posterior diameter, is obliquely from right to left, and from behind forward. The left parietal is likewise much flattened, which greatly diminishes the capacity of the cranium on this side, whence there must have resulted a great inequality in the cerebral hemispheres. This head resembles in this respect that of Bichat, with the difference, that the posterior depression is found on the opposite side. A similar conformation may be met with among all nations.

"Another head presents two osseous prominences in the auditory passage.

"Finally, the last, which is smaller, seems to be that of a woman: the anterior part, less broad and less elevated, announces more limited intellectual faculties; the occipital, more prominent at its superior part, by indicating a decided love for children, enables us to divine the maternal character, and the squamous portion of the temporal, more flattened, denotes less propensity to cruelty; which again comes in aid of the opinion of the sex of the individual, to whom this head belonged. It was, very probably, a woman; she was young, because the osseous prom-

inences are not marked, and because no suture is ossified.

"If, after the examination of the osseous prominences, we pass to that of the faculties, which, according to the discovery of M. Gall, they announce, we shall see the development of the parietal protuberances indicate circumspection, whence results the distrust to which the Papous are subject. We might say, that this is an instinct in half savage men, as it is in most animals. We may add, that in the Papous, distrust must often be brought in play by the wars, made on them by the Pirates of the surrounding islands, who fall upon them unawares and make them slaves. Without entering here into fuller details as to the customs, which belong more particularly to the history of the voyage, I will only say, that, when in a simple canoe, one of us (M. Quoy) visited the village of Boni, all the inhabitants fled into the woods, before it was possible to speak to them. It is, without doubt, this state of alarm, almost habitual to these islanders, which had led them to place their houses almost opposite dangerous reefs, of which they alone knew the passages, in order to have time to escape their oppressors.

"In one of the heads drawn, the lateral portion of the frontal, which we see below the semicircular line of the temples, and which touches the anterior inferior angle of the parietal, offers a remarkable convexity, and indicates a manifest disposition to theft. We know, that theft is a habit, to use the expression, proper to all these tribes, and that they execute it with more or less cunning and industry.

"But the most marked trait, denoted by the elevated temporal bone and temporal fosse, is the carnivorous instinct which is sufficiently developed, to lead to murder: a frightful propensity to which these islanders abandon themselves, and of which the bones in question are probably the result. The chief, or Kimalaha of Guébé, assured us, that there existed anthro-

pophagous tribes in the interior of the land of the Papous. This assertion reminds me, that, in landing at the island of Ombai, I saw suspended in the cabin of a native, in the village of Bitoka, a row of jaw bones. Six months before, a dozen Englishmen were killed and devoured by the ferocious Ombayens, in this island, where we, being few in number, incurred the greatest dangers.

“The elevation of the superior posterior and middle part of the frontal, and of the corresponding part of the parietals, is a sign of exaltation in religious ideas, whence flows the tendency to superstition. We ought here to say a word concerning the perfect arrangement and religious care, which these natives exhibit in the construction of their tombs. These are small huts in which several persons might be contained in an inclined attitude. The body there reposes in a box, which most generally encloses small idols rudely carved, bracelets, a comb, and hair. Sometimes we find nothing; in this case they are simple sarcophagi, raised to the memory of those who, having perished in combat, may have fallen into the power of the conquerors. At other times, a statue, placed under a small hangar, (*shed*,) indicates the place of the burial; or the spoils rest on piles, and are covered with a canoe reversed.

“The top of the head very elevated, announces inflexible firmness. We have no fact in support of this opinion.

“The posterior flattening of the cranium, which we have observed in five heads, shows that the organ of philoprogenitiveness, or, of the love of children is deficient. We see it prominent only in that, which, we have reason to believe, belonged to a woman. Our opinion coincides with that of M. Gall. It is in fact persons of this sex, who take care of the children; the men have no concern with them, and even appear indifferent to them. Among the negroes, on the contrary, M. Gall has almost always remarked the de-

velopment of the prominence, which indicates the existence of this faculty, the preservative of the species.

“The observations, which we have made on the Papous, the justness of which appears to us to be confirmed to a certain extent, by the study of the character of the individuals, who form the subject of them, seem to us to contradict the paradoxes of those morose philosophers, who, angry with the vices of men as they exist in society, have represented the man in the state of nature such as he is not, and have made of him an ideal being, in order to bestow on him attributes of power and means of happiness, which civilization can alone confer.

“We ought to add, that the Papous would be susceptible of education; that their intellectual faculties would require only to be exercised and developed, to make them hold a distinguished rank among the numerous varieties of the human race.” (QUOY et GAIMARD, *Zoölogy of Capt. Freycinet's voyage round the world.*)

We see by this relation, that other travellers have given a very mistaken idea of the organization of the head of the Papous, by representing it as extremely defective. The two heads here described are now preserved in my collection.

### *Of Physiognomy, or the Talent of Knowing the Interior of Man by his Exterior.*

We understand by the expression *physiognomy*, the art of knowing the moral and intellectual character of man, by the sole external conformation, not of his face alone, but of all the other parts of the body, without these parts being put in action.

Not only the vulgar, but even philosophers, give to this art the preference, over the physiology of the brain. Others imagine, that my researches on the



functions of the individual cerebral parts, and on the inferences to be drawn from a certain form of head, are of the same nature as those of the physiognomists. There is, however, absolutely, no relation between the two. A physiognomist, Lavater for example, is not at all guided by the knowledge of anatomy and of physiology; the laws of the organization of the nervous system in general, and of the brain in particular, are unknown to them; they have no idea of the different composition of the brain in different species of animals; they take no account of the different results of the different development of the cerebral parts. They know not the influence, which the brain exerts on the form of the head; they have no notion of the changes, which the encephalon and the cranium undergo in the different ages of life, in different diseases, in mania, &c. They are still imbued with prejudices imbibed in regard to the causes of the different moral qualities, and the different intellectual faculties, and to the divisions of them, which philosophers have established. Now, if we consider, that the material cause of all the qualities and all the faculties exists in the brain, how can we expect ideas conformable to nature, from men wholly strangers to the knowledge of the structure and functions of the brain?

Accordingly, all the observations of the physiognomists are founded on extremely variable indications. Physiognomists have not yet established a single solid principle, a single immutable sign. All that they have advanced amounts merely to *sensiblerie* and declamation. Read all the writings of Lavater, and you will every where find the same wanderings of the imagination, the same exaltation so contrary to the spirit of observation. The same character has its sign sometimes in a certain form of the eyes, sometimes in a certain form of the nose, mouth, hand, and even in a peculiar position of the teeth. This is easily explained; when the physiognomist knows the character of the person, and finds in him any part

formed in a manner which strikes him, this conformation becomes for him the distinctive mark of this character. When a criminal is led to the scaffold, there is no one who does not read his character in his face; whereas so long as he kept his place in society, no one saw, what is now seen written in such distinct characters.

Submit the same head, the same drawing to the judgment of three zealous physiognomists. Each of them is persuaded of the infallibility of his knowledge; and yet each of them will pronounce a totally different judgment. I have often shown a collection of four hundred casts to physiognomists, fully persuaded of the truth of this science. My casts give very faithfully all the forms of the forehead, of the nose, eyes, cheeks, lips, chin, &c., and yet not one of these physiognomists has ever either determined the general character, or indicated even a particular quality or faculty of either of the originals of my four hundred casts. All have constantly been deceived.

That, says one of my readers, would not have happened to me; a hundred times have I judged the character of persons from their physiognomy, and I doubt if I was ever deceived. Have you judged persons whose character was previously unknown to you? Have you given yourself the trouble, and have you had time to substantiate your judgment? Have you eaten a bushel of salt, with each of the persons whom you have judged? And how do you announce your judgments? *This is a good man, an essentially honest soul; this man has something deceitful in his eyes, I would not trust him; that is an amiable woman and of angelic temper; what a venerable matron! &c.* But what is there determinate in all these judgments? Do they teach us by what quality or what faculty, such an individual is distinguished?

I have proved, that the brain is exclusively the organ of the soul. There is then only the form of the brain or that of the osseous box, as far as it is deter-

mined by the form of the brain, which can enable us to judge of the qualities or faculties. There can exist no relation whatever between any other part, and the qualities or faculties. There is not, either in the nose, or in the teeth, or in the lips, in the jaws, hand, or knee, any thing, which can determine the existence of a quality or a faculty; these parts, therefore, cannot furnish any indication relative to the moral or intellectual character.

I know well, that, according to the physiognomists, there exists a certain harmony between all the parts of the body. "It is evident," says Lavater, "that the intellectual life, the faculties of the human understanding and mind, manifest themselves especially, in the conformation and situation of the bones of the head, and principally of the forehead; although, to the eyes of an attentive observer, they are sensible in all the points of the human body, on account of its harmony and its homogeneousness." On this hypothesis, it would be matter of indifference to take for the subject of observation, the nose, the knee, the foot, the chest, hand, or brain.

I have conversed on this subject with the most learned artists. Generally, they hold the opinion, that the form of a determinate part of the body being given, one can determine the form of the other parts; that the nose suggests the forehead, and the whole head; that a determinate form of the forehead necessarily supposes such a form of the nose. These assertions have induced me to make the most exact researches. I have examined with care, devotees, poets, philologists, voluptuaries, warriors, ambitious men, who had each the cerebral organ of their dominant quality or faculty extremely developed, and in each, I have found a different nose, different lips, different hands, &c.

In general, the physiognomists have recourse to more than one gratuitous hypothesis. They go so far as to say, that it is the soul, which builds itself its

external envelope, and, consequently, that this last must necessarily bear the impress of the qualities and faculties of the former.

1st. This assertion is proved by nothing.

2nd. It supposes that the cause of the difference of the qualities and faculties of the soul depends on the soul itself, and not on the material organs.

3d. Experience proves, that, both in man and in woman, the virtues and the faculties are not proportional to the beauty of the different parts of their body, or, of the harmony which reigns among them.

And after all, when a physiognomist has pronounced a judgment, by what has he been determined? Will he be able to tell me, what kind of eyes, nose, mouth, the person has, whom he has judged? He has, therefore, not judged from the forms of the parts, and, consequently, not as a physiognomist. The gestures, the movement, the habit of body, the motion of the eyes, the speech, &c., have determined his judgment, without his being able to render an account to himself, how he has passed a pathognomic judgment; that is, he has judged of the motion, and not of the form of the parts; in this case, we shall be able to understand each other.

It is not without a kind of confusion, that I mention the opinion, according to which one may judge the character of a man, by the resemblance he has to some animal. Where are these resemblances found? Again in the nose, the jaws, the eyes, the mouth; and what can they, consequently, indicate? Let two persons undertake to guess what animal I resemble, and each of them will name a different one. Yet, say they, Socrates resembled a Satyr, and he confessed himself, that he had the inclinations of one. But what kind of animal is a Satyr? And where is the strong head, whatever its physiognomy, which has not to struggle against the desires of the flesh?



*Of Pathognomics, and of Mimicry or Pantomime.*

I have said, that one does not judge as a physiognomist, when he pronounces a judgment on the character of a person, without taking an exact account of the forms of the parts, on which he founds his judgment. If the parts in question are in motion, and if it be the motions which we judge, we pronounce a pathognomic judgment; for the act of judging a person by his gestures, by the whole habit of his body, is *pathognomy*.

This art is founded in nature herself; for, it is nature that prompts all the gestures, the attitudes, the movements, finally, the whole pantomime, by which men and animals express all their feelings and ideas. Pathognomy has its fixed and immutable laws, whether we apply it to man or to animals, so long as the question relates to the same feelings and the same ideas. Pantomime is the universal language of all nations and of all animals: there is no beast, there is no man, who does not learn it; there is no beast or man, who does not understand it; it accompanies language and strengthens its expressions; it supplies the defects of articulate language; words may be ambiguous, but pantomime never is so.

Who does not recognise by his pantomime, the voluptuary, the bully, the boaster, the vain man, the devotee, &c.? Have men ever been deceived in regard to the expression of anger, despair, jealousy, the desire of vengeance, grief, tenderness, irony, gaitey, confusion, envy, &c.?

There are those, however, who pretend, that the expression of the affections, passions, feelings, ideas, is not subjected to invariable laws; that it is arbitrary, and varies with the man or the animal, that makes use of it.

There is no doubt, that the sentiments and the ideas are modified differently in every animal, that experi-

ences them, and that consequently the pantomime of each of these individuals, must be differently modified. Still, in essential points, all human individuals feeling and thinking in the same manner, their pantomime must also be essentially the same. If this pantomime were arbitrary, how would children and even animals understand it?

Another reason again, why the pantomime of the affections, &c. cannot be absolutely uniform in all its details, is, that there is almost always a complication of different affections, and that it is not, far from it, the complication of the same affections, which constantly takes place. Jealousy, for instance, expresses itself very differently, according as it is complicated with anger, with a repressed desire of vengeance, with confusion, pride, grief to see one's self betrayed, contempt, irony, &c. The pantomime must necessarily be complicated with the expression of the different sentiments, ideas, and passions, which affect the individual simultaneously.

What would become of engraving, painting, sculpture, the comic art, eloquence, poetry, if the expression of the sentiments and the ideas were not subjected to immutable laws? What means would they have in their power to paint modesty, prudence, contrition, fear, despair, baseness, remorse, innocence, joy, anger, contempt, pride, meditation, contemplation, devotion, or firmness? How would the eye of the dying gladiator say to us, *I die, but I am neither surprised nor grieved*. How would Laocoon present to us the image of man, sinking under sufferings without too much weakness? Who could comprehend their language? Would not the expression of love be confounded with that of hatred; the expression of envy, with that of benevolence?

Where, in fine, is the man or the animal, who takes time to deliberate on the manners, in which he would make his feelings and his ideas understood by others? Even at the moment, when the feeling and the ideas

arise, they are written on the exterior in characters discernible by all the world. It is certain, therefore, that the feelings, ideas, affections, passions, are manifested without, by suitable expression according to determinate and invariable laws.

But how happens it that each affection, passion, feeling, and idea, produces a peculiar and proper pantomime? Why does the humble man walk meekly along, with his eyes fixed on the ground, while the proud one struts with expanded chest and head erect? Why does the devotee raise his head forward, and direct his looks and hands toward heaven?

These are bold questions, and the bolder as no one as yet has entertained the idea of seeking the cause of these phenomena. Let us see if organology is capable of throwing any light on these mysteries.

*Of the Internal Sources of Imitation in general, and of the Imitation of each Feeling, of each Passion, &c., in particular.*

The brain is the source of all the feelings, ideas, affections, and passions; their manifestation, therefore, must depend on the brain and be modified by it. The brain is connected with the instruments of all the senses, and by aid of the spinal marrow, is equally so with the instruments of the voluntary movements. It controls the senses and the muscles, and consequently, the extremities; it puts in action each of the parts; by its activity it determines the movement they must make, the position they must adopt; as soon as it is at rest, the senses, the muscles, the limbs are inactive.

But the different cerebral organs are placed in different regions. The action of the brain, according as such or such an organ is active, must then commence from different regions. Each of the cerebral organs, in a manner peculiar to itself and suitable to its place, brings under its influence the instruments of the senses,

the muscles, the extremities. Each organ, therefore, expresses its action by a peculiar play of pantomime; consequently this play of pantomime is the peculiar language of the organ in question, and reveals, not only the nature of the feeling, the idea, the affection, the passion, but also the seat of the organ, from which their movements have proceeded.

Organology may then draw from mimicry two advantages equally valuable: 1. Mimicry may serve to indicate the place of the brain, where the organ which acts in such a particular case is found, and thus prepare for the organologist the way to arrive at proofs, which place beyond doubt, what at first he had only suspected: 2. It serves as a confirmation to him by concurring to prove, that the organ, of which he observes the action, is in fact placed where, guided by other facts, he had located it. In treating of the organs in particular, I might have reported in regard to each of them, what has relation to expression. I have not done it, because I thought I could dispense with this redundancy of proof, and I preferred to explain without interruption all that has relation to pathognomies.

The reader is now prepared to divine and to judge the expression of each organ in particular. But, before entering into any detail, I am going to determine the general principles of the external manifestation of the action of the organs.

1st. The organs, which have their seat in the inferior regions of the brain, when they act with energy, carry the head downward, depress and shorten the body.

2d. Those of the organs, which are placed in the superior regions of the brain, during their energetic action, elevate the head and the whole body.

3d. The organs, placed in the superior posterior regions of the brain, depress the head and the whole body backward and downward.

4th. The organs, placed in the inferior anterior regions



of the brain, direct the head and the whole body forward and downward.

5th. The organs, placed in the superior anterior part of the brain, elevate the head and the body and carry them forward.

6th. The organs, placed at the superior posterior part of the brain, elevate the head, the body, and carry them backward.

7th. The organs, placed in the inferior region of the brain, in a perpendicular line with the great occipital opening, depress down perpendicularly the head and the whole body.

8th. The organs, placed in the superior region of the brain, perpendicularly above the great occipital opening, elevate perpendicularly the head and all the body.

9th. When the twin organs of each function act simultaneously, the head and the whole body move symmetrically from above downward, from before backward, &c., according as the organ which acts, is placed in the anterior, posterior, superior, or inferior region of the brain.

10th. When there is only one of the two equal organs, which acts, the head and the body move on the side on which this organ is placed, from above downward, from below upward, from before backward, from behind forward, according as the organ acting is placed in the superior, inferior, anterior, or posterior region of the brain.

11th. When the two double organs act alternately, the head and the body perform alternately the motions belonging to their action, sometimes on one side, sometimes on the other.

12th. When the double organs, having their seat in the perpendicular axis of the brain, act alternately, the head moves on its pivot from right to left, and from left to right, from above downward, and from below upward, according as the acting organ is situated in the superior or the inferior part of the brain.

It is in consequence of these laws, that, when, in man or in an animal, a fundamental force is strongly in action, the senses, the limbs, and the head execute certain determinate movements, without the animal or the man having any deliberate consciousness of them. These movements are, therefore, a purely automatic language, and for that reason generally intelligible.

I shall examine the pantomime of most of the organs of the fundamental qualities and faculties, of which I have hitherto treated. In describing this pantomime, not such as I have invented it, but such as nature made it, I shall have occasion, not only to explain the twelve laws above announced, but also to add to the proofs already adduced new proofs, that the organs are situated in the region which I have assigned to them.

*Natural Language of the Activity of the Instinct of Propagation.*

The organ of this instinct being placed in the inferior part of the brain, in the occipital fossas immediately behind the great occipital opening, the head and the body must, conformably to the third law, be drawn backward, and from above downwards, whenever this organ acts with energy.

Que l'on observe, pendant l'accouplement, le taureau, l'étalon, le cerf, le bélier, le bouc, la souris, les oiseaux, etc., et l'on verra qu'ils retirent la nuque et portent le nez en avant, Pl. LXI. fig. 1.

Aussi de tous les temps les artistes ont indiqué, par cette attitude, le plus haut période de la jouissance amoureuse. Que l'on se souvienne de l'excellent tableau de Carlo Cigniani, représentant Joseph qui échappe aux brûlans désirs de la femme de Potiphar; l'impudique amante, le sein découvert, la nuque retirée en arrière, la bouche entre-ouverte, le regard en-

flammé, retient l'objet de sa passion avec ses deux bras étendus. Qui ne connaît cette représentation si vraie du Titien, des amours de Jupiter et d'Io, Pl. Lxi. fig. 2, et les vers de Lucrèce :

“ Atque ita suspiciens tereti cervice repostâ,  
Pascit amore avidos inhians in te Dea visus,  
Eque tuo pendet resupini spiritus ore.”

Lorsque ces caractères ne se rencontrent pas dans la jouissance, elle n'a point été complète.

J'ai déjà montré, à l'occasion de l'organe de l'instinct de la propagation, que dans la jouissance amoureuse, c'est au cervelet que se rapportent tous les gestes ; j'y ai cité les jeux par lesquels les oiseaux, les chiens, les chats, préludent au mystère amoureux, C'est en conformité de cette loi encore que l'Amour tient son bras passé autour de la nuque de Psyché.

### *Natural Language of the Organ of Attachment.*

This organ is placed by the side of the organ of the love of progeny ; the head and the body ought, therefore, during its energetic action, to be slightly inclined sideways and backward. This posture again has been very faithfully given by the ancients. There is a beautiful group of Castor and Pollux, in which we see their arms resting on each other's shoulders, and these friends pressing together their organs of attachment. In the *Madona au lapin* of Raphael, Mary presses this region of her head against the corresponding region of the head of the child, Pl. xcvi. fig. 1. Observe the pantomime of women very susceptible of a tender friendship, when they express to their friend the deep feeling, which animates them ; they place themselves side by side, embrace the shoulders of each other, and press together the posterior lateral parts of the head. We see the same attitude whenever we request two female friends to give each other proofs of their sincere friendship. Even when

two monks, meeting in their monastery, salute each other, each of them passes his arm over the shoulder of the other, and brings his own head near that of the other in the region, where the organ of attachment is found. The usual friendly salute between two men who meet, consists in touching each other's hand, moving it and pressing it gently, while one usually turns the side of the occiput toward that of the other.

Cats to testify their attachment lift their backs, turn the head laterally backward and from above downward, rubbing gently the organ of attachment against him, whom they caress.

If this pantomime is not always in reality as characteristic as I have described it ; it must be remembered, that friendship is not always as lively, as the usual protestations would seem to indicate.

### *Natural Language of the Organ of Self-Defence.*

This organ, as we have seen, has its seat at the inferior posterior angle of the parietals. It is placed on one side and a little below the organ of attachment. When it acts with energy, therefore, the head must be drawn a little backward and between the shoulders. When only one of the two double organs is active, the head should be drawn aside, backward, and against the shoulder of that side whose organ acts. Pl. xcvi. fig. 1. When the two organs are active to the same degree, this movement must take place alternately on one side and on the other.

It was the expression of the organ of self-defence, which first suggested to me the idea, that it is the seat of the organs, that determines the nature of gestures. I saw two coachmen fight ; one threw himself like a madman on his adversary, who was much smaller than himself ; the latter, leaning a little on one side, clenched his fist, drew his head between his shoulders, depressing it slightly, and repulsed victoriously the



attacks of his enemy by vigorous blows. Pl. *xcvii.* fig. 3. In fine, the greater one endeavoured by turning to take him in the flank. The smaller leaned still more, took the attitude of the fighting gladiator, bent his body forward, with head drawn back between the shoulders, and continued to repulse his enemy with success. The larger one, in the hope of flooring him, seized him in his arms; his antagonist, with his chin against the chest, grappled him with such force, that he overthrew him; the concourse of spectators put an end to the combat. While admiring the courage and address of my little victorious athlete, I made the following reflections.

1st. The organ of self-defence was here in full activity, and produced all the movements of the combatant. I was struck especially with his placing himself with the legs separated, the body drawn up, the occiput bent backward between the shoulders, a position which gives great steadiness to the whole body, but particularly with his advancing his chin a little. I naturally attributed this act of stiffening the neck, and drawing the head backward, to the state of excitement of the organ of self-defence, since these movements took place so near the seat of the organ; I was still confirmed in this idea, when I saw, that my athlete drew back the head towards one of the shoulders, taking an oblique attitude.

Above all, I saw manifestly, that, when there is only one of the double organs in action, the head is turned toward the side of this organ. At this period, I had already remarked, that animals, when they wish to regard an object attentively, turn the head sometimes on one side, sometimes on the other, according as they look or hear attentively with one or the other of the eyes or ears. I saw then, that the same thing takes place in the organs of the qualities or faculties.

Struck by this idea, I considered the expression of each of the organs which I had then discovered, and, to my great astonishment, I found that this expression

always corresponds to the seat of the organ which acts, and that the movements of all the other parts, the hands, feet, &c., correspond to this seat. Never should I have imagined, that it was given to man to penetrate into secrets of this nature, and I confess, that the joy of having made this discovery, which furnished, at the same time, such beautiful confirmation of all that I have previously discovered on the subject of the organs, nearly deprived me of my reason. To understand my ideas on expression, requires such an exact knowledge of the organization of the brain, of the seat of each of the organs, qualities, and faculties, and of the manner in which each of these organs manifests itself, that neither my hearers nor my readers will be able to agree with me, when this part of my doctrine shall be presented to them. The connexion, I establish between the expression and the seat of the organs, is too new and too profound a thought to be perceived at the first glance. Most persons even refuse to admit, that expression exists as I describe it. I have invented it arbitrarily, say they, in consequence of my reveries. It is only those, whose attention has been fixed on these objects, and who, having observed themselves and others, have thus become convinced, that the pantomime of the same quality, or faculty, for example, of boldness, of devotion, &c., is essentially the same in all individuals, that gradually become disposed to admit, that all the movements which compose it are involuntary, and that, consequently, they must proceed from the same determinate and immoveable cause.

When we direct our attention further into nature, we soon become familiarized with these ideas. In the state of health and in the state of disease, we execute all our movements according to the same laws. Who understands not the natural language, which accompanies the use of the external senses? Hardly can we perceive savory dishes, before our mouth waters; we observe the motions of the nose and mouth, when

we are attentive to an odor or a flavor. Before the animal or the man, who is tormented with thirst, reaches the cup, the mouth is already open, and the tongue applied to the lips to refresh itself in the liquid. Observe the effort of the eyes and the ears, when we look at an object, or when we listen to any noise. When we are menaced with a danger, before having any deliberate consciousness of it, we first give to the most exposed part the movement, which is most proper to diminish the danger. Not only the feet, the arms, the hands, but the whole body is involuntarily put in motion in a determinate manner. Those parts, which are more nearly threatened, contract even convulsively.

In the state of disease, in man as well as in animals, it is by the motions of the patient, that the physician frequently knows the seat of disease. When an animal is tormented by worms or by pains in the intestines, he always carries his mouth towards the place where he feels the pain. In the staggers, it is by the manner in which the sheep holds his head, that we judge of the part of the brain, where the hydatid is situated. A person without consciousness, stunned by a fall or a blow, always carries the hand to the suffering place, &c.

Those of my hearers who follow the course of my ideas in these reflections, will be convinced, that in fact the exterior man is only an impress of the interior. I hope it will be so, likewise, for some of my readers at least. But it is time to return to my subject. In the natural language of the instinct of self-defence, all the body in a manner concentrates itself; the muscles contract, the neck stiffens, the arms are drawn a little back, and the hand closed, the teeth are clenched, the eyes as well as the mouth threaten the adversary. The coward scratches his ears as if to excite the organ. Every day I see the same language even in animals, so far as the structure of their frame allows it; for example, in dogs, who are going to throw

themselves on each other. Cocks, at the moment of fighting, draw their heads briskly backward several times. Bucks, before throwing themselves on each other, raise themselves on their hind legs and bend back the neck. And thus these movements coincide with the seat of the acting organ.

*Natural Language of the Instinct of Destruction,  
and the Instinct of Murder.*

The organ of murder, or of destruction, has its seat immediately above the ears, in the perpendicular line of the vertebral column. The head, therefore, during the energetic action of this organ, is drawn back between the shoulders, and is carried neither forward nor backward, but makes a rapid movement, or rather it turns rapidly from left to right, and from right to left.

Sometimes my hearers have guessed admirably well the action of this organ; for, I am in the habit of giving the language of the organ of which I am discoursing. When one is so enraged against another as to exclaim; "If I had him I would tear him in pieces; if I meet him," — he raises his two fists, and shakes them, one on each side of his head, with great force, he sets his teeth, and makes a violent movement from right to left, and from left to right, with the head drawn back between the shoulders. Notice in Pl. LXIX. fig. 1, the position of the woman, Albert, at the moment when she prepares to murder all her family. The head is strongly drawn back to the neck; she poises in her hand the hatchet, the instrument of her crime; and yet this is the only position she recollected, as she recalled it to her memory, when the artist asked her in what attitude she was, when she committed the deed.

In the chase, we hold the dogs at the moment, when, thirsting for blood, they are going to rush on



their prey, they set the teeth with violence, foam at the mouth, bark furiously, and shake the head with violence. Often in the combat of animals, at Vienna, I have seen oxen and bulls in their rage, in presence of the enemy, whom they threatened to annihilate, groan, bellow, and throw into the air with their feet, sand and stones, shaking with fury their heads, which they had drawn back upon the neck. So the lion, breathing nothing but carnage and death, shakes his mane with fury. If animals shake with violence, their prey, which they are strangling, the movement may be attributed to the same cause.

### *Natural Language of Cunning.*

The organ of cunning is placed in the lower part of the forehead in front, but not altogether in the anterior part. Hence it follows, that, during the energetic action of this organ, the head and the body must be carried forward and downward. When the double organs act alternately, the head and the body are gently turned from right to left, and from left to right. While turning thus, the cunning man looks aside, and accompanies the movement of his head and body by an analogous movement of his forefinger, which he holds extended. Hence the expression, *a low, vile flatterer, a cringing man.*

When an Italian wishes to warn you against a perfidious and false man, he looks aside at this man with an expression of distrust; he points to him stealthily and downwards with the fore-finger of one hand, and with that of the other he depresses one of his own cheeks. Pl. xcvi. fig. 4. The expression would be still more just, if he carried the fore-finger to the temple, which probably too is the original gesture. When by cunning one has accomplished his object, one of the eyes is partly shut, or throws an expressive look on one side; he walks with a wolf-like tread;

the fore-finger points out the dupe; and he gently elbows his companion, to announce the victory, as mysteriously as he performed the trick; or, he designates the dupe by making a slight motion of the head one side, Pl. xcvi. fig. 5, all, movements, which represent the mode of address of the cunning man, and which are always in relation with the seat of the organ.

The tiger and the cat, when they watch their prey, or approach it with the wolf step, place the head flat on their fore paws, or lie with the body flat, and the fore and hind paws extended before and behind, the eyes and the tail moving gently, sometimes to one side, and sometimes to the other. The fox has the same gait, when he creeps out of the wood.

Even dogs, when in playing together they wish to surprise their comrade, either place themselves straight on their feet, which have an oblique direction forward and backward, the head horizontally extended, or they lie flat on the ground, the head extended, and drawing themselves gently forward in zigzag direction, until finally they leap with petulance on their adversary. The sparrow, when any thing is offered him to eat, provided he has not yet been tamed, approaches it only by giving to his body, a direction more or less oblique.

### *Natural Language of the Instinct of Property, or Avarice.*

As the organ of the instinct of property is also placed laterally in the temples, but more forward than backward, during its energetic action the head will be carried forward and a little on one side, the arms stretched forward, the hands sometimes opened wide, to receive, sometimes the fingers curved, as in the act of catching a fly that is escaping. A beggar, who asks alms of you, will never walk straight up toward you;

he always advances obliquely, with his head forward and his hand half open.

*Natural Language of Circumspection.*

The organ of circumspection is placed in the superior external lateral part of the parietals, a little backward from the perpendicular, which passes by the centre of the occipital opening. Consequently, during its energetic action, it raises the head and the body, and gives the head a rotary movement, at the same time that it carries it backward. Observe a man, who, after having reflected a long time, arrives at some particular plan, and dwells on the means of putting it in execution. While he reflects on the course he ought to follow, his body is bent forward; once decided, he raises himself suddenly, turns his head, sometimes to the right, sometimes to the left, holding it slightly inclined backwards, while the eyes wide open, follow the movements of the head, and their direction corresponds to the place of the organ. Pl. xcvi. fig. 6.

The roe-buck is too circumspect to take flight immediately when chased, like the boar or the fox, who save themselves by stealing off at the first noise. The roe-buck delays deciding, he hesitates and wanders here and there, until he is seen nearly on all sides. Thus, with the head raised, he looks on all sides, seeking to discover hills and bushes: finally, obeying the impulse of his terror, he endeavours to make his way through the hunters and the waylayers. I have seen a marten, which was pursued into a granary, follow the same method; she had not perceived me; sometimes she raised the head, and turned the eyes from one side to the other with anxiety: when she perceived, that she was approached more nearly, she retreated by lying flat on the belly. We may observe the same language in the rabbit, the squirrel,

and even in the circumspect birds, the woodpecker for example.

*Natural Language of the Sense of Hauteur, and of Pride.*

The organ of pride has its seat in the median line, in the superior posterior part of the head. Consequently, during its energetic action, it elevates the head and carries it a little backward.

See the proud man bridle up, straighten himself, and carry his head high. See how he carries his arms forward, in the attitude of command; sometimes admiring himself he raises them: then throwing from his high elevation a look of contempt on all that surrounds him, he crosses them on his breast, or gesticulating with his right, he supports the palm of his left on his side, with the elbow advanced. Pl. xcvi. fig. 7. Ask this man to interest himself in your behalf with the king: he will protect you with a look, he will carry one of his hands on his breast, in testimony of his powerful influence, he will straighten himself on the points of his toes, and a gracious movement of the head directed upward and backward, will say to you: *Leave it to me.* The more profound the feeling of pride is, the more audaciously does the man swell and erect himself; the more does the look, which he throws about him, express self sufficiency and contempt; the more space does he pass over in his solemn walk. The man, who has a consciousness of his own merit, of his own talents, likewise raises his head with dignity, straightening the whole body. Pl. xcvi. fig. 8. A very lively lady expressed to me her regret, at having made an inconsiderate step through pride. Cursed pride! said she, carrying her half open hand to the seat of the organ. In general the case is not rare, that, at the moment of the extreme activity of an organ, the hand is hastily carried toward its seat.



Thus, then, in the expression of pride, all the gestures indicate a tendency to raise one's self, to enlarge, to lengthen the stature. "I know no people" says Engel, "no race of men, in whom pride does not carry its head high, does not raise all the body, and cause the man to elevate himself on his feet, in order to appear taller."

In speaking of pride as a fundamental quality, I have spoken of the expression of those, who are maniacs through pride. This expression is essentially the same in the maniac, as in the sane man; only, by reason of the subirritated state of the former, all the gestures are outraged into caricature.

The attitude of the proud courser magnificently caparisoned, of the cock that has just vanquished his enemy, coincide with the attitude of the proud man, so far as the relation of the form of these animals to the human form permits it. In each case the head is high; the movement, grave and measured.

When we wish to express humility, submission, respect, our natural language is precisely the reverse. The head and the body are bent forward; every thing tends to contract our person: from the profound reverence of kneeling, to the oriental salute on the face, all demonstrations of respect are only the true or simulated expression of the absence of all pride, of all feeling of one's own merit; an expression dictated by the intention of making evident a devotion without bounds, an entire submission, unequalled humility, profound respect. Every where a shortening of the stature, a contraction of the body, and carrying it forward. Pl. xcvi. fig. 9. This expression is a language generally received, consequently natural and founded in the nature of man: it can be explained only by the absolute inaction, and the complete apathy of the organ of pride. Never, and in no country, will man express respect, obedience, submission, by raising his head and carrying it backward.

Confusion results from wounded pride. Accordingly

the mortified man retires, not only with the language of humility, but he also covers his face; he endeavours to escape all observation; he would wish to hide himself in the centre of the earth.

### *Natural Language of Vanity.*

The organ of vanity is placed a little farther backward than that of pride, and more on one side. Consequently, with an energetic action of this organ the head and the body must be raised and carried backward: and, as the double organs are further apart than those of pride, the body and the head must be turned alternately, sometimes on one side, sometimes on the other; hence results a balancing of the whole body. So long as vanity manifests itself tranquilly, the vain man, like the vain woman, holds the head raised; they walk balancing themselves, and turning the head on one side and the other, to see if they are admired.

The fop, vain of the most frivolous advantages, struts, separates his legs, makes gestures to the right and left, squares himself, draws his head backward, and advances with an important air, carrying himself as much sideways, as forward Pl. xcvi. fig. 10.

In treating of the organ of vanity, I spoke of the sensibility in animals, both to praise and to disapprobation. Observe in his cage, either a canary bird or a goldfinch; while you address him in a kind tone, you will see him turn from side to side, and answer you in affectionate accents, expressive of his pleasure. I here recall to the reader the interesting pantomime of my little dog, when she was receiving praise, while she carried my slipper in her mouth, and I beg him to re-examine the article on the organ of vanity. He will here see movements, which proceed from the region, where the organ of vanity has its seat, or which are referable to that region.

*Natural Language of the Organ of the Memory of  
Names and Words.*

This organ has its seat above and behind the eyes. When a person is embarrassed in recalling a name, he holds the eyes fixed and raised, passes the palm of his hand over the eyebrows, presses and rubs the lower part of his forehead, as if to excite the activity of the subjacent cerebral part. Men ordinarily make the same movements, when they try to recite a piece learned some time previous. There are persons, who accompany with several other movements the tension of the eyes, and the action of rubbing the forehead; they bite their fingers, strike their thighs with their hands, &c. But these gestures belong only to individuals; whereas the movement of the eyes, and the action of carrying the hand above the eyebrows, and rubbing the forehead, are always seen.

*Natural Language of the Organ of the Arts.*

This organ has its seat in the temples, nearly at the height of the superciliary ridges. During the energetic, alternative action of the double organs, the head and the body must sometimes be carried to one side, sometimes to the other, and make a movement similar to that of a bird, which looks at an object sometimes with one eye, sometimes with the other, or that of the dog, which, in watching, hearkens sometimes with one ear, and sometimes with the other. Observe a milliner making a hat; in order to judge of it well, she never places it directly before her, but holds it obliquely, bends her head forward, and views it alternately on one side, and then on the other: she brings to it, therefore, sometimes the right organ, sometimes the left. This is manifest; for, otherwise, why should she not hold the hat directly

before her, and look at it with both of her eyes at once?

Pl. xcvi. fig. 2, a sculptor examines his works with an attentive eye; he is placed a little obliquely; with the left hand, he sustains the elbow of the right arm, and with the expression of thought, places the two fingers of the hand precisely on the organ of the arts. His head is obliquely bent on one side. When he is fatigued with this position, he assumes the corresponding one on the opposite side.

We see on the tomb of Piranesi, a fine statue, which represents this artist, reflecting on his art; it has the position which I have just described.

### *Natural Language of Music.*

The organ of music being placed on the anterior inferior edge of the forehead, its energetic action imparts to the head and body an oscillating movement, from behind forward, and from side to side. Every body knows the natural language of a passionate amateur, who hears fine music. He keeps time with his head and with his body; and manifests his delight by inclining his head, and turning it from side to side.

When I see a person play on any instrument, the body motionless, I am sure that his playing is without soul. When, on the contrary, he sometimes gently inclines on his instrument, and raises himself, with his eyes directed obliquely upward, balancing himself, it is an evidence, that he is filled with his subject.

A musician of my acquaintance, passionately fond of his art, almost to madness, traverses his chamber, trilling, and even walks the streets almost without consciousness; commonly he holds his head bent forward, sometimes he raises it suddenly with his eyes fixed, and his looks obliquely directed towards heaven; this is always the moment of inspiration.

We have some portraits of musicians, which repre-



sent them in this attitude. The engraving of Dussek, among others, presents the moment of inspiration. Pl. LXXXVI. fig 1.

I know a composer, who, while composing, constantly strikes himself on the seat of the organ of music. When he gives himself to a different kind of mental exertion, he exhibits wholly different movements.

M. Garat, in my presence, was requested to sing. At the moment of commencing, he passed his hand first on the organ of tones on the right side, and then on the left. Did he make this movement to animate the organ? Or did the organ already in action, give this movement to his hand? At a party, Madame Catalini could find no language to express the gratification which singing caused her; in this state of embarrassment, she carried on each side the palm of her hand on the organ of tune; rubbing this part with the expression of the most lively joy. These, without question, are movements which proceed from the organ of tune, and which re-act upon it.

### *Natural Language of the Sense of Localities.*

The organ of the sense of localities is placed in the anterior inferior part of the forehead, by the side of the organ of educability. We very rarely have an opportunity to observe its action. But in the following instance, however, I had it in my power to do so. One day, while I was talking with a philosopher on the subject of the city of Vienna, the latter, not being able to recall to his memory one of the streets of the city, placed before his eyes the index and ring finger, which he held separate, and which he moved gently, and then with his eye fixed he ran over the different quarters of Vienna. We perform nearly the same action, when we are doubtful at the entrance of a court.

*Natural Language of Poetry.*

The organ of poetry is placed in the superior lateral part of the head, above the temples, and extends obliquely from below upward and backward. The individual before mentioned, who, while he composes music, vibrates his finger on the organ of tones; when he writes a poem, raises himself obliquely towards heaven. We shall never see a poet in any other attitude, at the moment when his genius inspires him. So much was this the favorite attitude of Pope and Schiller, that the artists have represented them in this position. Pl. xcvi. fig. 12. Usually the poet places his finger on the poetical organ. Let me not be told, that this position of the hand is for the support of the head; we have seen, that, during the activity of the other faculties, it is placed in a different region.

*Natural Language of Satire.*

Those, who have a decided inclination to make epigrams, and to utter sarcasms, during the paroxysms of their caustic humor, carry the hand or the finger to the superior lateral region of the head, where the organ of satire has its seat. This was the favorite attitude of the satirical Born, author of the *Monachology*. Pl. xcvi. fig. 13. It is in this attitude, that Sterne was engraved. Pl. lxxxiii. fig. 6. Here the position of the hand is very different from that of the poet and the sculptor, &c.

*Natural Language of Meditation.*

The organ of comparative sagacity, which acts in meditation, is placed in the anterior superior part of

the forehead. Every body knows the expression of profound meditation ; but, as this act is most generally complex, its expression ought also to vary greatly ; still, the movements, both of the head and the hand, indicate that the exertion takes place in the anterior superior frontal region. Sometimes the arms are crossed, and strongly pressed against the chest, the eyes motionless, the head sometimes raised, sometimes depressed forward. Pl. xcvi. fig. 14. The whole superior part of the forehead, is supported in the palm of the hand ; the eyes are shut ; the fore-finger is placed on the middle superior region of the forehead ; sometimes the head is dropped ; sometimes the eyes are raised, as if seeking for an object, and when the idea is caught, the individual raises himself hastily, and carries his hand, extending the fore-finger, as if he were pointing to what he had discovered, saying to himself, "that is it." Pl. xcvi. fig. 11. When we wish to induce any one to reflect, we apply the finger to the summit of his forehead, saying to him, "come, collect your ideas." When, through haste, we have committed any folly, in the moment of anger, we strike the forehead, saying, "stupid fellow that I am."

### *Natural Language of Benevolence.*

The organ, the energetic development of which determines benevolence, has its seat in the median line of the anterior superior part of the forehead. It must necessarily be directed toward the object of its action. As the organs of friendship of two individuals tend to touch each other ; so the organs of benevolence seek to place themselves in reciprocal contact. In a group of small children, we sometimes see two, who, penetrated with friendship and benevolence, bring together their heads precisely at the place of the organ of this feeling. This expression has given rise to the saying in German, *die Kinder bockeln*, that is, the chil-

dren strike their heads together like bucks. See also the beautiful compound expression of surprise and benevolence, Pl. xcvi. fig. 16., the arms extended towards the person welcomed, and the direction of the head: how could benevolence be better expressed?

### *Natural Language of Devotion.*

The organ of devotion is placed in the median line, in the upper part of the upper half of the frontal bone near the top of the head. Consequently, during its energetic action, the body and the head are carried forward and upward. The arms and the eyes are directed towards heaven. Pl. xcvi. fig. 16. Sometimes the hands are united, sometimes each on its own side is gently elevated or inclined, according as it is joy, hope, or resignation, which prevails. When, in fine, it is the idea of the grandeur and of the omnipotence of the Supreme Being, which exclusively takes the lead, the man humbles himself, and penetrated with profound veneration, adores in the dust; an expression of which I have already made use while speaking of the organ of pride. I have seen a man making a fervent prayer, who had absolutely inclined his head against the ground, and who made every effort to touch the pavement, not with the forehead, but with the organ of belief in God and religion.

The act of raising one's self to heaven, it is said, is founded on the belief, that God dwells there on high, and has nothing in common with the seat of an organ.

But, who has told us that God dwells on high? From our infancy we are taught, that he is present every where. If then our action proceeded from our belief, when we were under the influence of religious feelings, we should turn ourselves in all directions. But, whenever we are influenced by a feeling, whenever an organ acts in us with energy, we do not think of what has been taught us; it is an internal force that



directs our movements. There is no one who, under the influence of surprise, in an emotion of joy, or sudden terror, does not carry his head and his eyes toward heaven, exclaiming, my God! my God!

Finally, why, in spite of instruction, which tells us the contrary, cannot we get rid of the idea, that God is on high? It is simply because the organ, which renders man capable of raising himself to the idea or perception of God, has fixed its throne in the most elevated part of the brain, whence it always has exerted, and always will exert its influence on all the other forces of man.

### *Natural Language of Firmness.*

The expression of firmness has its seat immediately at the top of the head; during its energetic action, therefore, it holds the head and the body elevated perpendicularly. At the instant we adopt the firm resolution, not to allow ourselves to be turned from our purpose by any thing, we raise the whole body vertically, we raise ourselves a little from the ground, place our legs firmly on the earth, and, with the neck extended, prepare to brave all obstacles. It is to this attitude, that is referred the expression of an immutable will, of an inflexible character. Pl. xcvi. fig. 18.

To these partial expressions of each particular organ let us also add some general expressions, which designate a certain general state of the brain: Pl. xcvi. fig. 19, the melancholy man abandons himself, without resistance, to his chagrin; fig. 20, the entire inaction of the brain of the idiot; compare these states of apathy with the expression of the man, all whose attention is fixed on the recital of an interesting event, fig. 21, and especially compare them with the expression of excessive joy, fig. 22.

The reader will pardon me, if I submit to him also two drawings, which may well be regarded as simple

objects of curiosity. My friend Kummer, who was attached to the unfortunate expedition of the *Medusa*, sent them to me, making the remark, that the head-dresses appeared to him to be a confirmation of the discovery of the seat of the organs; fig. 23 represents the head-dress of a lady of Kacundy; the distribution of the hair, in particular tufts, is conformable to the organs of propagation, of the love of progeny; the organ of pride is even surmounted with a kind of plume. Fig. 24, the head-dress of a Moorish lady of Krarsas, which shows the organs of propagation, of the love of offspring, of attachment, of self-defence, of cunning, of circumspection, of the religious sentiment, of firmness. An unaccountable occurrence, if it is not allowable to presume, that it is the action of the organs of the brain, which has determined this singular manner of arranging the hair.

M. Demangeon, in his analysis of my large work, has very well caught the spirit of my principles and my opinions, in relation to pathognomics. After having advanced that the art of the physiognomist does not exist, that is, that it is impossible for any physiognomist to determine any form of nose, of chin, of eyes, &c., which is always found in connexion, in different individuals, with any moral quality or intellectual faculty, he continues: "But he (M. Gall) attaches great importance to expressions, of which he treats fully in this same section, and from which he draws very many new proofs to the support of the organs, which he has determined, as if to corroborate the demonstration. According to him, it is pathognomy, and not physiognomy, which guides us in our judgments, when, in place of founding them on determinate external forms, we found them on the gestures and the whole carriage of the person. Pathognomy, or pantomime, is a language founded on nature herself, who inspires the gestures, the attitudes, the movements. It is a universal language, from which all nations and all animals derive the expression of

their affections, passions, sentiments, and ideas. There is no man, no beast that does not understand it. It supplies, enforces, renders precise, and illustrates spoken language, by developing irony, anger, confusion, desire, grief, sadness, tenderness, jealousy, despair, revenge, friendship, aversion, pride, vanity, fatuity, stupidity, deceit, cunning, the spirit of chicanery, devotion, sensuality, &c. Without pantomime, eloquence, poetry, the dramatic art, painting, sculpture, engraving, would fall to the level of purely mechanical arts, and no longer would have either expression or attraction. This language, therefore, is not one of pure convention, as some persons have thought; it is based on immutable laws, the violation of which would throw us into nonsense and folly, though it be not uniform in all its details, on account of the almost infinite complications of affections, and the extremely variable predominance of one over the other. After these general observations, M. Gall makes known the kind of expression proper to each organ, and thence draws new proofs in support of those, which he has already furnished."

### *Conclusion.*

When hereafter my readers, by their own observations, shall have convinced themselves of the justness of the expression, which I have just exhibited for each organ, they will acknowledge, that it furnishes a new proof in favor of the region, where I place the seat of the organs. Each simple expression is the action of an insulated organ; it is therefore one of the elements of a complex expression; just as each of the fundamental forces is one of the elements of a complex idea or sentiment, one of the elements of every moral and intellectual character.

Every man, therefore, who wishes to express certain sentiments or certain ideas with truth, or render

them intelligible to others by means of the language of action, must fulfil one of the two following conditions:

Either; the actor must know exactly the simple expression, in order to know of what gestures, of what movements of the muscles, of what positions he shall compose the play, by which he will attempt to render with truth the complex sentiments and ideas, which he is most frequently called on to represent. This condition can then be easily fulfilled by him, who has familiarized himself with the expression, which each organ produces, conformably to its seat. For such a connoisseur, there is no pantomime which he cannot reduce to principles; that will not happen to him, which happened to Engel, in his excellent work on expression, for want of knowing the true origin of gestures. This author often designates such a pantomime as perfectly in harmony with nature, but without being prepared to reduce to certain rules the precepts which he gives. When men are convinced of my doctrine, pantomime and a great part of the art of declamation, will no longer be abandoned to an obscure and uncertain feeling, but will be found reduced to sure and invariable principles.

Or; again, he who undertakes to render faithfully, and in all their degrees, complex sentiments and ideas, ought to be endowed with the faculty of impressing himself with these sentiments and ideas to such a degree, that, in order to render them, he may need nothing, but the inspiration of his own genius. Such are those natural actors, who, in all parts suited to their talents, are true and inimitable, without effort and instinctively. Such are the men of whom I have spoken, in treating of the organ of expression. If, every where, the parts were assigned only to those chosen persons, the stage would always present to us nature herself; but I mean nature idealized, nature fulfilled. National prejudices would soon disappear in all coun-



tries; all would soon have the same taste; every where applause would be offered only to the image of nature; all extravagance and bombast would be pronounced prejudicial to that illusion, which constitutes the first object of the dramatic art.

So far as the action of the internal organs marks durable traces on the exterior man, it is right for us to draw from these marks, which are the results of this continually repeated action, inductions relative to the habitual occupations and the fundamental character of a person. By such impresses we can doubtless distinguish the superficial man from the profound thinker; the good liver from the devout man; the man of repartee from the dull idiot. We easily distinguish the rich man from him who is oppressed by misfortune; but it is not certainly by the original proportions of his face, nose, mouth, ears, &c., but simply by the influence, which the internal forces exert on the external parts. It is, therefore, a pathognomic judgment, and not by any means a physiognomic one, which we pass in such cases.

### *Of Universal Language.*

We know what Leibnitz, and Descartes before him, have written on the possibility of a universal language. Since then, many philosophers have proposed means for realizing this idea; each, according to the measure and nature of his acquirements.

Those, who speak of a universal language, mean to speak of a language, which should be understood by every body. But when, at the same time, they propose a language formed of arbitrary signs, which it would be necessary to teach and learn, it is evident that such a universal language is impossible. How shall we work the miracle of uniting all nations in such a manner, that they shall all consent to adopt the same signs, whether words, gestures, alphabetic

signs, or manual alphabet, or finally, hieroglyphics? Accordingly all efforts, directed towards this end, have been thus far fruitless, and will ever be so.

There is not and cannot be any universal language, except what Nature herself has created. Men may learn to speak it better, to understand it better, but they will never perfect its elementary principles.

We have seen that each organ, however feeble its action, manifests itself externally and instinctively by certain movements of the muscles, by certain gestures, by certain exclamations or involuntary cries, by certain attitudes. Those movements of the muscles, gestures, cries, and attitudes, betray the organ which is in action. They consequently also betray the nature of the propensity, of the feeling, of the thought, which, at the moment, occupy the individual. This language, therefore, is the natural language; it is expression, it is the language of gestures or of action, the pathognomic language.

We shall know the alphabet or the elementary principles of this language, when we know all the fundamental qualities and faculties, as well as the particular expression, that accompanies each of their manifestations. Study the gradations of the qualities and faculties, as well as those of their expression, and if you wish to represent the expression of the union of several propensities, feelings, thoughts, make of these gestures, muscular movements, cries, attitudes, what you make of your words, of your alphabetic and numerical characters; combine these elementary principles as much as your feelings and thoughts are combined, and you speak, you hear, the universal language. You see the same language in brutes, and for the most part they understand you; you interpret justly the groans of the new-born infant, and the latter understands the caresses of its mother. It is the profound study of this language, that reveals to the actor the mysteries of pantomime, that adds to the recital of events a peculiar charm, which makes of the arts,

such as the arts of painting, drawing, sculpture, the most eloquent arts.

If this language is not as generally perfect, as it might be, it is because we have greatly neglected it; it is too easily replaced by the language of words. But observe the deaf and dumb, before they have received any instruction; the exactitude and the readiness, with which they communicate to each other the emotions of their souls, feelings, sentiments, thoughts, and their intentions, will prove to you, that the language of action has many advantages over spoken languages. Do we not daily see, that numerous collections of people interpret without mistake the pantomimes of our plays? Roscius engaged to translate, by gestures, the periods of Cicero with the greatest fidelity, even when it pleased the orator to change their character by varying the turn of expression, or transposing the words. According to this, it is wrong to say, that the language of action is not sufficiently developed, that it is not rich enough, and wants delicacy. It must at least be confessed, that it remains always the most energetic, and the only one of which we know the use in the excess of passion, when the violence of our feelings deprives us of the reflection, necessary to express them by purely conventional means. Even in idiots and in madmen, the language of action still serves us as interpreter of the feebleness and the disorder, with which their mind is struck.

The language of action will be the more perfect and intelligible, as the sentiments and the ideas, which it is wished to express, are more vividly felt. It is for this reason, that men and nations, endowed with great vivacity of character, employ commonly and simultaneously the language of action and the language of words. It is difficult for every body to dispense wholly with the former, although the latter alone would suffice to render us intelligible. We better support a violent declamation, than the sleepy

monotony of a discourse or a lecture, and there is no farce more revolting and ridiculous at the same time, than to hear words declaimed with contradictory gestures and intonations.

The intimate and immediate connexion, which exists between the language of action and the operations of the organs of the brain, is also the source of that sympathy, which, by means of the pathognomic language, gives rise in us to the same sentiments and the same thoughts, with which pantomime is itself animated. Hence this precept: *Si vis me flere fletum est primum tibi ipsi*. On this has been founded a theory of the influence, which signs exert on our feelings and on our ideas. But signs are nothing, and have no meaning for beings incapable of the feelings and the ideas which these signs express. These signs will not even be understood, they will awaken no feeling, no determinate idea, until the individual has previously experienced corresponding ideas and feelings. It follows, that the influence of the internal functions on the external signs, must necessarily precede the influence of the external signs on the internal functions; that the functions are the condition *sine quâ non* of the signs, and not those of the functions. These remarks limit exceedingly the proposition adopted by the ideologist, that without signs we should not think. Without feelings and without ideas, there would be no sign, and any language, whatever, can never have more signs than those, who form it, have ideas and feelings. From long reflection it would not be difficult to arrive at the proof, that even spoken language is a product of the language of action. The latter is not limited to gestures. It is not less natural to man to produce sounds, cries, exclamations, when he is vividly affected, than to produce certain movements of his limbs. It is from this source that spoken language has drawn all its first elements.

We see by all that I have said, how much interest



as well as advantage, is offered by the study of the expression of the language of action, and if ever there is a prospect of a universal language, it can be realized only by the fullest knowledge of the influence of the interior on the exterior man.

---

Remarks on some passages of the work of M. Georget, entitled *Physiology of the Nervous System, and especially of the Brain*.

The great number of passages, which I have copied from M. Georget's *Physiology of the Nervous System*, must have convinced this young author how much I am pleased with it. But this very consideration leads me to correct some ideas which he has advanced respecting me and some other writers.

Vol. I. p. 78, he addresses me with compliments, and with the following language: "I say it openly, it is in the lectures and in the works of Dr. Gall, that I have reconciled myself with the study of the noblest attributes of man, that I have learned to familiarize myself with the knowledge of them; it is from this time only, that I have had a fondness for such studies, that I have known how to profit by the lucubrations of authors; it is doubtless also to these lectures, that I owe my having made researches on the other attributes of the nerves. Those, who see, or rather who admit of, nothing in the works of this philosopher, but hypothetic structures, but a doctrine of bumps, but divisions of the cranium into compartments, will perhaps be astonished at this eulogy; let them read and meditate on the works of M. Gall, this is my sole answer.

"Besides, they will see, that I am far from thinking, that this celebrated philosopher has not erred; that he alone has travelled the road of truth; that no one, before him has spoken of what he regards as the foundation of his doctrine; in this last respect, I shall even reproach him with having been too sparing of textual

citations, where they might have lost him the character of originality. After the works of M. Gall, I shall place those of Bonnet; they ought to be placed before, if we consider, that they were published at a much earlier period. This learned naturalist, this philosopher who wrote nearly sixty years ago, has given the soundest notions on the seat and the mechanism of intelligence. So long as he confines himself to the domain of physiology, his opinions conform to observation; it is only when he throws himself into metaphysical questions, that he forgets himself, and talks nonsense like a metaphysician. We shall quote from him some very remarkable passages, which perhaps will give no pleasure to Dr. Gall."

Page 3, he says: "I shall here reproach Dr. Gall. What motive could have induced him to pass over in silence the works of Kant and Bonnet? Could it be because their ideas had some analogy, as we have seen, with his own? How happens it, that he only attacks Descartes and Locke by bringing forward opinions attributed to them, and not their own expressions, which is not always the same thing; while he has great care to quote literally, and to refute at length (which he hardly does for the preceding writers) those authors who have advanced exaggerated opinions, purely gratuitous, and hence very easy to destroy?"

Page 143. "Doctor Gall thinks, that the brain is exclusively the organ of moral qualities and intellectual faculties; and he accumulates the most direct proofs which confirm this proposition.

"I shall also reproach this physiologist with having been unjust toward his predecessors; all whom he charges, *in globo*, with ignorance of the functions of the brain. Yet has he read Bonnet, who preceded him more than sixty years, in a career which he has run so gloriously, since he often places his name among those of his adversaries; Bonnet, who so posi-

tively says, and plainly proves by a great number of arguments, of which M. Gall too avails himself, that the brain in man and animals is the organ of thought and of feeling, that is, of the ideas and the passions. How many other examples might I not quote, which would show that it is not solely from the appearance of M. Gall, that we must date the origin of physiological knowledge on the mechanism and the seat of the intellectual functions!"

In the preface, which is at the head of the first volume of my large work, I have expressed myself in this manner: p. 31. "We hope in the course of all this work, never to humble ourselves so far as to say any thing whatever, for any other purpose than that of truth. To betray nature, in order to pay personal court, is a thing unworthy of the naturalist. The greatest men will therefore pardon us, if we seek to rectify the errors, which, we may think we have found in their works. Their errors and their prejudices deserve the more attention, as they are more likely to be propagated from age to age. Notwithstanding this we are not less filled with a sentiment of esteem and gratitude for the services, which they have rendered to humanity; and who in fact could forget the signal services which Reil, Prochaska, Sæmmerring, Scarpa, Walter, Cuvier, &c., have rendered to the study of the nervous system? But who also, even with the most penetrating and most scrupulous spirit of observation, does not sometimes err or find himself mistaken, when the point is to seize the most complicated whole? Who can foresee the discoveries reserved by another path to the person, whom happy circumstances, chance, or application shall aid? Who among us would not wish to recommence his works from the place where he has terminated them, or finds himself detached from them? The true investigators of nature, having no other object than truth, ought to desire that those, who succeed them, may not be dazzled and deceived by the false glare, with which either indi-

viduals or academies shine or glitter. The suffrages, solely based on the consideration of private individuals, are the less flattering, in proportion as they attest the weakness of those who bestow them.

We have also frequently proved in detail the falseness of the opinions of men, who, in the judgment of many of our readers, did not perhaps deserve any attention on our part. It is certain, that we should not have exposed ourselves to the reproach, which might be made to us in this respect, if we had not taken into consideration the history of the science, and if it had been possible for us to conceal the names of the authors and the partisans of certain objections. Whoever is *once* convinced of a truth by the evidence of facts, finds all objections equally insignificant; but it is not so with those, who doubt, nor with those, who read in order to be instructed. How will these do to distinguish a well founded objection, from one that is only futile?

It has happened but too often, that men of the greatest merit have proposed to us the most trifling scruples. Each has a chain of ideas of his own, with the points of contact and habits which are peculiar to him. Such an one, who in certain respects greatly distances his cotemporaries, finds himself, in other respects, ages behind them; hence the reason, that the greatest men fall sometimes into incredible misapprehensions. If we only answered the doubts and difficulties of men, who constitute authority, how many times should we run the risk of being accused of error in our choice? Here all depends on the degree of acquired knowledge. If we are asked, for example, whether it is the muscles that produce the protuberances of the brain? MM. Ackermann, Walter, Hufeland, Portal, adopt the affirmative without hesitation; while we are convinced with Sømmerring, that it is in contradiction with the laws of organization and all facts. Is it the brain, which is soft, or, the cranium, which is hard, that impresses its form on the



other? If we decide for the first opinion, we shall have against us, perhaps, the greater part of our readers, almost all the physiologists and pathologists, though Galen already had caught a glimpse of this truth. In the North of Germany they consider as superfluous the arguments by which we establish, that the dispositions are innate in man, without his moral liberty being the less real: and besides, one has, on the contrary, much trouble to bring himself to the idea, of the coexistence of innate dispositions, with the faculty of not being wholly mastered by them. While in agreement with the fathers of the church, with moralists, and with instructors, we demonstrate the influence of organization on the exercise of the intellectual faculties, without, however, rendering the soul material, Walker, Ackermann, Steffens, and a host of others, raise the cry of materialism. Where then shall we begin or where shall we stop, in order not to speak of objections, important or insignificant in the eyes of every one? Each author and professor has his part and his sphere of activity. Such an one may appear at a distance, of colossal merit, but, on near approach, he inspires pity. Where again is the miserable writer, who, in taking part for or against an opinion, does not find his supporters in the friends or the enemies of this opinion? According to this, as we present without distinction the two sides of the question, in seeking to remove all doubts and all objections, we may hope that our readers will have for our explanations the same indulgence, that we have had for objections and doubts of every kind.

And p. 40. "In order to present the opinions of each author in all their force, we have almost always quoted his own expressions. In this manner no one will be able to complain, that we have abridged or disfigured his ideas, and all readers will be able to compare our opinions with those of others, and to pass on them an impartial judgment."

All my work is compiled according to these princi-

ples. Hence that great number of passages literally quoted from other authors ; hence at the head of each treatise there will always be found the history of the subject. See, in vol. I. of my large work in 4to, the treatise on the great sympathetic nerve, p. 29 ; on the nervous system of the vertebral column, p. 47 ; on the difference of automatic life and animal life, p. 79 ; on the nerves of the head, p. 127 ; on the functions of the five senses, p. 149 ; on the method of examining the brain, p. 233 ; on the anatomy of the cerebellum and brain.

I have done exactly the same in the other volumes. After having established the innateness of our propensities and our faculties, and after having proved, that their manifestation depends on the organization, I directed myself to refuting the objections, and I have never failed to exhibit literally the opinions of Plato, Quintilian, Malebranche, Helvetius, Locke, Condillac, Bonnet, Haller, Buffon, Sprengel, Herder, Bichat, &c.

In the treatises on materialism, fatalism, and moral liberty, you see not only several passages of the most philosophic fathers of the church, but also those of Malebranche, Bonnet, Condillac, Leibnitz, Pascal, Cardinal Polignac, Helvetius, Lavater, Tracy, Ancillon, Kant, Fluenbach, Sonnenfels, Pinel, Prochaska, Fodéré, &c.

In the section on the organ of the mind, which constitutes the subject of the second volume, I have commenced by the exposition of the most striking opinions on the seat of the soul, and on the reciprocal action of the soul on the body, and of the body on the soul. The reader will be able to determine, whether, in my adversaries, I have addressed myself to feeble authors, and whether I have neglected to report literally the passages of my partisans, whether ancient or modern.

As the matter in the following volumes belongs almost exclusively to me, there is less room for quota-

tions. Yet you will still meet the names and the passages of Laurens, Diemerbroek, Fichté, Blumenbach, Sæmmerring, Hufeland, Walter, Rudolphi, Richerand, Portal, Dumeril, Cuvier, Plattner, Ackermann, Fodéré, Dumas, Home, Sprengel, Esquirol.

Even in the particular treatises on the fundamental powers and on the seat of their organs, I have scrupulously quoted all that could have relation to my subject. For example, in connexion with the propensity to propagation, and that of the love of offspring, I have copied literally the passages of Apollonius of Rhodes, of Van-der-Haar, Tissot, Formey, Pinel, Richerand, Larry, Cabanis, &c.

One would not certainly expect to find in a physiology of the brain, the names of Ferguson, Sobry, Grimm, Dupont de Nemours, Rousseau, Laromiguiere, &c.

Could I quote more fully and report more literally than I have done, the opinions of George le Roi and professor Pinel, whose expressions are so infinitely more just and more in harmony, than those of Kant and Bonnet?

It must be allowed, that in all my quotations I have been impartial in my selection. The same author sometimes served me as a support, sometimes I treated him as an adversary, without any regard to authority, or to reputation, or to the influence of the person, the age, &c. It is in my nature to take the good wherever I find it, and always to attack the front of prejudice and error.

My proceeding is, therefore, the opposite of that of most French authors, who are willing, in a preface or in any other place, to designate lightly men whom they have read thoroughly, but of whom they make no mention in the body of their work. An excellent means of giving themselves all the latitude of usurping furtively the honor of others!

Since the question relates to quotations, who has more right to complain than I have? I should make vol-

umes, if I wished to enumerate all the robberies committed on my property. In order the better to conceal the fraud, they usually take the precaution to slide in some words of criticism or contempt against the author, whom they are preparing to plunder. We shall find proofs of this in almost all the works written in late times on the physiology of the brain, and it is only necessary to read the works of Richerand, and the article, *Touch*, of MM. Chaussier and Adelon, who have made an extract from my treatise on the functions of the five senses, as if they had not the slightest knowledge of my work.

Let us now look at the passages, which cannot be expected to please me, and appreciate at the same time the true value of the favored authors of M. Georget.

Vol. I. p. 124; M. Georget says: "It is especially in Charles Bonnet, that we shall find the plurality of the organs of the brain admitted in the most formal manner; we can never be wearied of quoting this great man. 'Without being initiated in the secrets of anatomy, one may know, at least in general, that a brain is an extremely compounded organ, *or rather an assemblage of many different organs*, formed themselves by the combination or interlacing of a prodigious number of fibres, nerves, vessels, &c. The prodigious multiplicity and diversity of the ideas, which arise from the different operations of our mind, may enable us to judge of the astonishing art, with which the intellectual organ of our thoughts has been constructed, and of the almost infinite number of parts, and of parts infinitely varied, which enter into the composition of this surprising machine, which, to speak in the spirit of the philosopher, incorporates an abridgment of nature. . . . Hence, it follows, that an intelligence, which should understand thoroughly the mechanism of the brain, which should see in the greatest detail all that passes there, might read in it as in a book. This prodigious number of organs infinitely small, appropriated to feeling and to thought, would be to



this intelligence, what the characters of printing are to us. We turn over books, we study them; this intelligence would limit itself to contemplating brains. . . . Our feelings of different kinds belong to fibres of different kinds. . . . The degree of agitation determines the vivacity of the feelings, the species of fibre decides the kind of feeling. . . . In fine, how do we remedy that fatigue, that pain, which results from too long continued attention to the same series of ideas? By rest or a change of objects. Why by rest? Because it is a cessation of action. When the mind no longer acts upon the fibres on which it has acted, the tension, that it has impressed upon them, diminishes, because enfeebled and lost. Why by a change of object? Because the soul acts no longer on the same fibres. Each perception has fibres which are appropriate to it."

Page 141. M. Georget goes on to say: "The reader has not forgotten the quotations, we made from the *Palingenesia* of Bonnet, so very positive in relation to the seat of intelligence; I will add to them the following from the same author. 'Assuredly, if it were permitted us to see to the bottom of the mechanism of the brain, and especially of that part, which is the immediate instrument of feeling and thought, we should see the most attractive object presented by the terrestrial creation. We are never satisfied with admiring the apparatus, and the play of organs, destined to incorporate a piece of bread with our own substance. What, however, is this spectacle, compared with that of the organs destined to produce ideas, and to incorporate with the soul, the whole world? All there is of grandeur and beauty in the globe of the sun, yields without doubt, I do not say to the brain of man, but to the brain of a fly. . . . We are therefore led to believe, that the organization of the brain of animals, differs essentially from that of the human brain. We shall hardly run any risk of self-deception in judging of the relative perfection of the two machines,

by their operations ; and how superior are the operations of the human brain to those of the brain of animals ! How much has reason the advantage over instinct ! It appears, therefore, that the brain of the brute is a machine incomparably more simple than that of man ; the construction of the animal machines has been calculated on the number and the diversity of the effects, which they had to produce, in relation to the place, which was assigned to each species in the scale of animal life. The brain of the monkey, much less complex than that of man, is incomparably more so than that of the oyster.' ”

M. Georget seems to wish to insinuate to his readers, that I have designedly concealed the names of the authors, who, before me, had already formed some idea on the functions of the brain, and on the plurality of the organs of intelligence. If M. Georget had read my work with less haste, he would have seen, vol. II. p. 214, in the statement of the most remarkable opinions on the seat of the soul, and on the reciprocal action of the soul on the body, and of the body on the soul, the names of the sects and the authors, who professed on this subject opinions more or less absurd. He would have seen the names of Stahl, Pythagoras, Plato, Galen, of the Stoics, of Aristotle, of Erasistratus, Herophilus, Servetto, Auranti, Van Helmont, Descartes, Varthou, and Schelhammer, of Drelincourt, Bontekoe, Lancisi, Lapeyronie, Willis, Vieussens, Ackermann, who all have had some suspicion, that the brain is the seat or organ of the soul. But, after these quotations, we must not forget to read also, p. 217, the solution of the question, whether, in the actual state of our knowledge in physiology, it is proper to be still making researches on the organ of the soul ? and we shall see what confusion, what uncertainty and vacillation reigns in the opinions of Hippocrates, Reil, Dumas, Richerand, Sprengel, Pinel, Esquirol, Fodéré, Bichat, Sabatier, Roger, Darwin, Buffon, George le Roi, Vicq d'Azyr, Cuvier, Stahl, of

whom several even deny absolutely, the influence of the brain on the faculties of the soul.

Does M. Georget wish to accuse me, as the journalists formerly did, of having wished to make my readers believe, that I am the first, and the only one, who has conceived the idea of the plurality of the organs? Then I refer him again to vol. II. p. 356. Let him read again the statement of opinions on the difference which exists, as well between the different moral qualities, as between the different intellectual faculties, on the plurality of the organs, and on the seat of those organs; in which article I have made no change in this edition.

He will find in this statement the opinions, on these matters, of the Greeks, of Pythagoras, of St. Paul, of Galen, Gilbert, Gassendi, of Bacon, Van Helmont, Wepfer, Willis, Leibnitz, Frederick Hoffman, Haller, Blumenbach, Barthez, Casimir Medicus, Reil, St. Augustin, Plato, Anaxagoras, Aristotle, Stahl, Malebranche, Condillac, Vieussens, of the ancient Jesuits, Peripatetics, Arabians, of Vockerodt, Carpus, Gregory of Nissa, of Albert the Great, of Mundini of Luzzi, of Servetto, of Petrus Montaguana, Ludovico Dolci, Willis, of Charles Bonnet, p. 359, l. 25; of Lancisi, of Lapeyronie, of Haller, and Van Swieten, of Cabanis, Mayer, Prochaska, of Plattner, Malacarne, Chanut, Wrisberg, Tiedemann, Richerand, Cuvier, Degerando, Sæmmerring, Ackermann, Bérard, and Montègre, &c.

The passage of Bonnet, which so much interests M. Georget, I had quoted in my answer to the report of the Institute, p. 248, where he says, that an intelligence which should know fully the mechanism of the brain, which should see in all its details what passes there, would read as in a book, &c. I have quoted him, vol. II. p. 34 and 38, where he affirms with reason, that it is only by the physical, that we can penetrate into the moral constitution of man. I have quoted him, p. 77, acknowledging, as he does, that there is

no truth useless or dangerous. I have quoted him, p. 100, adopting his, the only just, definition of moral liberty. Finally, I have quoted him, p. 412, where he says, that, if fatigue ceases when the mind changes its object, it is because it then acts by other fibres.

All these literal quotations are very far from exposing me to the suspicion, of having intended to distract my readers from the ideas of Bonnet. As I have never ranked this philosopher among my opponents, whatever M. Georget may say, I will add also, some passages of the *Palingenesia*, which will give him pleasure. Let us first copy the passage, which M. Georget has himself reported, p. 103. "I have then supposed, that each species of sensible fibre has been originally constructed on relations, which are applicable to the mode of action of its object. Our brain has, therefore, been organized in a direct relation to those marvellous operations of our mind, by which it gradually brings itself to the most general and most abstract ideas. Rather a bold genius, (Helvetius,) and one who knows how to manage his subjects with as much art as grace, has thought, that he made a very philosophic step in discovering, that the horse differs from man only by the hoof. It appeared to him, that, if the feet of the horse, in place of terminating by an inflexible hoof, had ended in supple fingers, he would soon have attained to a level with man. I doubt whether a philosopher, who shall have deeply studied the nature of animals, will applaud the discovery of this ingenious author, whose merit ought not to be confounded with his opinions; he had not considered, that any animal whatever is a particular system, all of whose parts have a mutual harmony among themselves. The brain of the horse corresponds to his hoof, as the horse himself answers to the place, which he holds in the organic system; if the hoof of the animal were converted into flexible fingers, he would not be the more capable of generalizing his sensations; the hoof would still exist in



the brain ; that is, the brain would want that admirable organization, which enables the soul of man to generalize its ideas ; and were it ordained that the brain of the horse should undergo a change corresponding to that of his feet, he would no longer be a horse, but another animal, which would require a different name."

Page 31. Bonnet says : "I maintain that, supposing all souls perfectly alike, organization would suffice to introduce varieties among them. And what is there more evident? A mixed being feels and perceives only by the aid of his senses. All his sensations and perceptions are always in a determinate relation to the number and the quality of his senses.

"Would the human soul, placed in the brain of the oyster, ever acquire notions of morals and metaphysics? Its nature, indeed would remain the same ; but it could not display its activity, as it displays it in its own brain. It would, therefore, be extremely degraded by the sole diversity of organization ; and if it were possible, that a soul so degraded should preserve a remembrance of what it had been in the human body, it would be a most terrible misfortune to it to be condemned to inhabit the body of an oyster.

"I suppose there is no essential difference between human brains ; and this supposition seems to me legitimate, the number and nature of the senses being the same in all men ; but all men do not derive the same advantage from their senses. What a difference in this respect, between Montesquieu and a Huron!

"The senses communicate with the brain, and produce there durable impressions, sources of imagination, of memory, of reasoning. A disease may derange all the economy of the brain, and annihilate imagination, memory, reasoning ; it does not annihilate the soul, yet the latter is reduced to the state of the soul of the brute.

"If the brain is modelled in any way by external

objects; if there are fibres appropriated to each kind of perception; if these fibres retain the impressions which the objects have impressed on them; if such is the law of the union of soul and body, that to certain fibres, and to certain states of these fibres, certain sentiments, certain perceptions in the soul constantly correspond, we must admit that the soul of a Huron, lodged in the brain of a Montesquieu, would there experience the same sentiments, the same perceptions, as the soul of Montesquieu.

“It would there experience the same successions, the same combinations of sentiments and of perceptions; for, I persuade myself, that I have well established that the connexion of our ideas depends originally on that of the sensible fibres. If it were not so, how should it happen, that physical accidents, which can only affect these fibres, should destroy the connexion of our ideas?”

Thus far, all is perfect, all is excellent. But was Bonnet free from the prejudices of his time? Has M. Georget always understood him correctly?

Notice here, p. 110, Bonnet applies himself to the research on the location of the soul: “Whatever be the part of the brain, which is the seat of the soul, or the immediate instrument of its operations, we cannot help admitting, that there is, somewhere in the brain, an organ, which unites the impressions from all the senses, and by which the soul acts or seems to act on different parts of its body.

“We see clearly, that the action of objects is not limited to the external senses. The action of sound is not confined to the tympanum, nor that of light to the retina; there are nerves, which propagate these different impressions to the brain. Those, who, after having lost the wrist, still feel the fingers, show us satisfactorily, that the seat of the feeling was not where it seemed to be. The soul does not, therefore, feel by the fingers. Neither is sensation in the external senses.

“We are very little informed in regard to the intimate structure of the brain. Anatomy is lost in this dark labyrinth. It sees the nerves of all the senses converge there; but, when it endeavours to follow them in their course, they escape it, and it is compelled to conjecture or to grope.

“We must, therefore, give up determining precisely what is that part of the brain, which constitutes the seat of the soul. A celebrated anatomist (de la Peyronie), proceeding by way of exclusion, has maintained, that the seat of the soul is in the corpus callosum, because all the experiments, he has tried, have appeared to him to prove, that this is the only part which cannot be wounded or altered, without the functions of the soul suffering more or less.

“Another anatomist, Lorry, has contradicted this result, and attempted to establish on other experiments, that the seat of the soul should rather be in the medulla oblongata. He produces in its favor facts, which seem decisive. I will quote only a single one: we know animals which have no corpus callosum: the pigeon for example, has none according to what this anatomist says; and yet we cannot deny the pigeon a soul.

“However it may be with this question on the seat of the soul, it is very evident that all the brain is no more the seat of perception, than all the eye is the seat of vision.

“But, if we are not permitted to penetrate into the secret of the mechanism of the brain, we can at least study the effects, which result from this mechanism, and thus judge of the cause by its effects.

“We know that we have ideas only by the aid of the senses; this is a truth, which experience attests. Experience also teaches us, that our ideas of every kind are chained to one another, and that this connexion belongs to the combination, which the fibres of the senses have together.

“It therefore follows, that the different senses with

which we are endowed, have, somewhere in the brain, secret communications, by means of which they may act on one another.

“The part, where the communications take place, is that which must be regarded as the seat of the soul. It is the internal sense.

“This part, therefore, is, in some way, the epitome of all the senses; since it unites them.

“But it is also by this part, that the soul acts on its body, and by its body on so many different beings. Now the soul acts only by the agency of the nerves; it follows, therefore, that the nerves of all the parts, which the soul governs, must terminate in this organ, which we regard as the immediate seat of feeling and of action. It is in this sense, that I have said that this organ, so exceedingly complicated, was a *neurology* in miniature.

“We see sufficiently, by all that I have just stated, that it is of little importance to my principles, to determine precisely what is the part of the brain, which properly constitutes the seat of the soul. It is sufficient to admit with me, that there is in the brain a place, where the soul receives the impressions of all the senses, and where it displays its activity. I have shown, that this supposition is not gratuitous, since it flows immediately from facts which cannot be called in question.”

Let us suppose that Bonnet is really of opinion, that each nervous fibre is endowed with a certain perception or faculty: of what avail would that be to enable us to arrive at the knowledge of any organ whatever? Let any one discover in the optic nerve the fibre which sees red, the fibre which sees yellow, &c., and here we should not have to do with organs of a different nature, but only with the modifications, with the different capacities of the same organ. Thus, the so much admired passages of Bonnet are not more significant than the suppositions of Albert the Great, of Servetto, Dolci, &c.; and had Bonnet a juster



knowledge of the fundamental qualities and faculties, for which alone it is possible to discover organs? It is for the same reason, that those who had some more reasonable presentiment of the plurality of the organs, have, notwithstanding, always despaired of its being possible to discover them: such was the definitive opinion of Haller, Van Swieten, Prochaska, Cabanis, &c.

If it be true, as Bonnet maintains, according to the philosophy of his time, that we have ideas only by the aid of the senses, how do you allow the innateness of a propensity or a faculty, and consequently how can you admit, that its organ previously exists in the brain? Thus every thing limits itself, in Bonnet's system, to a simple aptitude, a capacity of receiving such or such an impression, by the aid of the senses: to wit, that by their means such or such an operation might take place.

Finally, when Bonnet tells you, that all the brain is no more the seat of sensation, than all the eye is of vision; when he tells you, that the soul acts only by the agency of the nerves, that it therefore follows, that the nerves of all the parts which the soul governs must terminate in this organ, which he regards as the immediate seat of sensation and action; by the expression *sentiment*, he constantly means nothing more than sensation, the first impression made by the senses on the brain, and by no means the psychologic sentiments, such as the sentiment of pride, benevolence, &c. Consequently, M. Georget does Bonnet infinitely too much honor, when he lends him the idea, that the brain is the organ of sentiments, that is, of the affections, passions, propensities; and it is not sufficient to quote his authors literally, it is necessary to hear their language.

The general expressions of Bonnet frequently reveal sublime and very just ideas; but, as we have just seen, it is precisely this generality which imposes on us. As soon as he enters into detail, he betrays the

crudeness of his conceptions. He, who so well perceived, that the brain of the horse answered to his hoof, how could he all of a sudden abandon this luminous idea, and admit that "a single organ, a single sense, may have been constructed with so much art, that it may alone suffice to give to the animal a great number of ideas, to diversify them, and to associate them strongly together. It will combine them even with so much the more force and advantage, as the fibres, which shall form its seat, shall be more intimately united in the single organ."

"The trunk of the elephant is a beautiful example, and one that will well illustrate my idea. It is to this single instrument, that this noble animal owes his superiority over all other animals; it is by this, that he seems to hold the middle place between man and brutes. What pencil can, better than that of the painter of nature, express all the wonders worked by this sort of universal organ !

"This trunk," says M. Buffon, "composed of membranes, nerves, and muscles, is, at the same time, a member capable of motion, and an organ of sensation. The elephant can shorten, lengthen, curve, and turn it in all directions. The extremity is terminated by an addition in form of a finger; and it is by means of this, that the elephant does whatever we do with our fingers. He picks up from the ground the smallest pieces of money; he gathers herbs and flowers, choosing them one by one; he unites knots, opens and shuts doors by turning the keys and pushing the bolts; he learns to trace regular characters with an instrument as small as a pen.

"In the midst of this finger-shaped extremity is a concavity, in the bottom of which are found the common passages of smell and respiration. The elephant has, therefore, his nose in his hand, and is able to join the power of his lungs to the action of his fingers, and by a strong suction, to draw up liquids, or lift very heavy bodies, by applying to their surface the

extremity of his trunk and making a vacuum by inspiration.

“Delicacy of the touch, exquisite scent, facility of motion, and the power of suction, are found, therefore, at the extremity of the elephant’s trunk. Of all the instruments, with which nature has so liberally furnished her favorite creatures, the trunk is perhaps the most complete and the most admirable ; it is not only an organic instrument, but a triple sense, whose united and combined functions are at the same time the cause, and produce the effect, of that intelligence, and of those faculties, which distinguish the elephant and raise him above all animals. He is less subject than any other animal to the errors of the sense of sight, because he rectifies them promptly by that of touch, and making use of his trunk, as of a long arm to touch bodies at a distance, he forms, as we do, correct ideas of distance by this means,” &c.

The eloquent historian of the elephant then unites, in a single view, the various services, which this great animal derives from his trunk. “Touch,” he continues, “is that one of all the senses, which contributes most to knowledge ; the delicacy of the touch gives the idea of the substance of bodies ; the flexibility in the parts of this organ gives the idea of their external form ; the power of suction, that of their weight ; the smell, that of their qualities ; and the length of the arm or trunk, that of their distance ; thus, by a single limb, and, so to speak, by a single act, the elephant feels, perceives, and judges several things at once ; now, a multiple sensation, is in some respects equivalent to a reflection ; therefore, although this animal is like others deprived of the power of reflecting, as his sensations are found combined in the organ itself, as they are cotemporaneous and, as it were, indivisible ; it is not surprising, that he has of himself, species of ideas, and that he acquires in a short time those, which it is desirable to give him.”

I have already proved in several places, that it is

precisely the inverse of the relation of Buffon and Bonnet, which exists between the senses and the understanding. It is not the perfection of the senses, which gives intelligence to the brain; but it is the perfection of the brain, which determines the employment of the senses, or of external instruments. Why are the monkey and the idiot incapable of employing their hands in objects of art? Why does the rabbit construct a burrow, and the witwall suspend its nest so artfully between two boughs, while, with the same instruments, the hare and the cuckoo never do any such thing?

As respects Kant, I have always heard him spoken of, in Germany, with enthusiasm. But, by a singular fatality, I have never had a sufficiently transcendent mind to comprehend any thing of his philosophy. The books, whether of jurisprudence, medicine, or metaphysics, written in the style of Kant, Fichté, Schelling, &c., have always disgusted me by their bombastic, unintelligible, corrupted style. I shall endeavour to prove, in the following volume, how mistaken M. Georget is, when he thinks he finds some resemblance between my ideas and those of this too profound philosopher. The most sublime intelligence will never be able to find in a closet, what exists only in the vast field of nature.

The same reproaches, which M. Georget has addressed to me, having been made to me also by others, with a certain air of importance, these gentlemen will please hear with indulgence my profession of faith.

Few are more modest or humble than I am, when I take a view of that immensity of things, of which I am condemned to be ignorant, though they are immediately connected with my profession.

But when the question concerns the discovery of the structure and the functions of the brain, it is with unshaken confidence, that I consider myself in advance of all my predecessors, as well as my cotemporaries.



In fact, I may claim to be the first, that has established physiological principles, according to which the structure and functions of the brain ought to be studied; the first, that has passed the barrier, which superstition and philosophy, for thousands of years, had opposed to the progress of the physiology of the nervous system; the first that has conceived the idea of distinguishing general attributes, from the real fundamental qualities and faculties; the first, that has determined the instincts, propensities, sensations and talents, which belong to certain cerebral parts; the first that has had the courage, patience, perseverance, to examine and fix the relations, which exist between the energy of the moral qualities, of the intellectual faculties, and the different developments of the parts of the brain; the first that has extended these researches through all the animal kingdom; that has studied thousands of animals, in regard to their most striking instincts, propensities, faculties, and the configuration of their brain, both in individuals and species. No one, before me, has found and pointed out the only means capable of discovering the seat of each instinct and propensity, of each sensation and intellectual talent. I claim to be the discoverer of these seats and to be the first that has demonstrated them by numerous irrefragable, pathological, and physiological facts, and by an infinity of researches into the comparative anatomy and physiology of all the tribes of animals.

All these conceptions, and all these fundamental truths, even previous to our journey undertaken in 1805, were already diffused by my numerous hearers in all parts of the learned world; and if the anatomy and physiology of the brain have been perfected at a later period, it is still either to the works of M. Spurzheim and myself, or to that only true direction, that we have given to the labors of other anatomists, that this degree of perfection is due. Where is the author who, in regard to any essential part of my

doctrine, has ever manifested any thing but vague conjectures, lightly conceived and quickly dissipated. All have stopped at generalities, more or less plausible in appearance, and all have retracted as soon as the point was to fix a principle, an immutable proposition. You quote to me, and I myself quote the Mayers, Hallers, Van Swietens, Herders, Vicq d'Azyrs, Cabanises, Prochaskas, Sæmmerrings, &c.; well, all have despaired of the possibility of discovering any organ whatever; all have followed the paths of the sterile philosophy of Plato, Leibnitz, Wolf, Descartes, Locke, Condillac, &c. Not one has had the slightest presentiment of the nullity of all these doctrines; not one has dreamed of analyzing the moral and intellectual economy of man and animals; of determining the instincts, propensities, sensations, faculties! You quote to me the most celebrated of your naturalists, M. Cuvier, and I quote him also. But read his works from one end to the other; read his report on our memoir, presented to the Institute, in 1808; read the Dictionary of the Natural Sciences; read what, in his *règne animal*, he says on the impossibility of recognising the instincts by the form of their brain; what vacillation, what tergiversation, what uncertainty, what contradiction of his own opinions, appear on every page. And has this distinguished naturalist succeeded in making a single true application of his knowledge of comparative anatomy, to the physiology of the nervous system in general, and especially of the brain, in particular?

Let any one read with candor the history of philosophy; of the progress of comparative anatomy and of the physiology of the nervous system; read what is still objected to the plurality of the organs; how men still hesitate to admit the fundamental qualities and faculties, and the seats of their organs, without which the physiology of the brain is reduced to a mere chimera; and then maintain, that before me physicians, philosophers, conceived and taught a clear and exact idea

of the functions of the brain and its constituent parts !

Indeed, it may be said, that to me only the physiology of the brain owes its existence. That I have discovered it without the aid of any one whatever, the history of each of my discoveries sufficiently proves. It is with the physiology of the brain as with its structure. To unravel whatever might by chance have been found in the writings of authors, would have required infinitely more sagacity, than to divine, by means of observation, the mysteries of nature. I commenced, continued, and almost completed my discoveries without any previous instruction ; and, if afterward I compiled quotations from others, it was rather to manifest my point of departure from them, than to strengthen my ideas.

Let us close these remarks by an objection, which M. Georget makes to the doctrine of the functions of the different cerebral parts : “ But,” says he, “ there are very great difficulties touching the mechanism of the exercise of these faculties, which M. Gall has not resolved, or even assailed, at least so far as occurs to me. How do all these faculties communicate together, so that several are simultaneously in action, as happens in the smallest intellectual operations ? How do they mutually derive the knowledge proper to each, as must happen to the metaphysical sense, to the poetical sense ? &c. How do they receive impressions by means of the sensorium ? Is it reasonable, credible, that twenty-seven or thirty-five faculties can communicate equally with the sensorial power, and be particularly stimulated by the impressions in relation with their destination ? The difficulty, which appears to me the greatest and hardest to resolve, is this : how happens it, that there is only one *self*, one sentiment of existence, one single consciousness of the thinking being ? Or, in other terms, how happens it that each of these members of the intellectual power has not its distinct consciousness, its intimate sense of existence ? Why do all

the intellectual operations, sensations, perceptions, operations of the mind, passions, &c., produce the effects of being felt, perceived, executed, excited by a single power, and refer themselves to one single *self*?"

How happens it, that M. Georget, who has already so often rejected the insinuations of the metaphysicians, assumes all at once the air of wishing to place himself under their banners? How do all the organs of voluntary motion, how do the five senses communicate together, in such manner, that several may be simultaneously in action? For my answer I refer M. Georget to the axiom: *no difficulty whatever can destroy a fact*. You do not explain either fecundation, or life, or sensation, or thought, or digestion, and yet fecundation is effected, and life, sensation, thought, digestion, take place. In conclusion, I refer you to what I have said on these idle questions in several places of this work. And, if you are still eager for explanations, I refer you to the tribunal of metaphysicians, who explain every thing, *without knowing any thing*.















---

ON  
THE FUNCTIONS OF THE BRAIN  
AND  
OF EACH OF ITS PARTS:

WITH  
OBSERVATIONS ON THE POSSIBILITY OF DETERMINING THE IN-  
STINCTS, PROPENSITIES, AND TALENTS, OR THE MORAL  
AND INTELLECTUAL DISPOSITIONS OF MEN AND  
ANIMALS, BY THE CONFIGURATION  
OF THE BRAIN AND HEAD.

---



CRITICAL REVIEW  
OF SOME  
ANATOMICO-PHYSIOLOGICAL WORKS;  
WITH  
AN EXPLANATION OF A NEW PHILOSOPHY  
OF THE  
MORAL QUALITIES AND INTELLECTUAL FACULTIES.

---

By FRANÇOIS JOSEPH GALL, M. D.

TRANSLATED FROM THE FRENCH  
By WINSLOW LEWIS, JR., M. D., M. M. S. S.

---

IN SIX VOLUMES.

VOLUME VI.

BOSTON:  
MARSH, CAPEN & LYON.  
1835.



Entered according to the act of Congress, in the year 1835, by MARSH, CAPEN  
& LYON, in the Clerk's Office of the District Court of the District of Massachu-  
setts.

CAMBRIDGE PRESS:  
METCALF, TORRY, AND BALLOU.

# CONTENTS.

	Page.
PREFACE . . . . .	1
The anatomy of the brain, containing the history of its development in the foetus, with a comparative exposition of its structure in animals : by Frederic Tiedemann, &c. : translated from the German by A. J. L. Jourdan. Paris, 1823 . . . . .	9
Journal universel des sciences medicales, vol. xxx. p. 309 . . . . .	23
Anatomy of the brain, containing a history of its development in the foetus, with a comparative exposition of its structure in animals ; by F. Tiedemann : translated from the German by A. J. L. Jourdan : with 14 plates. Paris, 1823 . . . . .	32
Advantage of comparative anatomy . . . . .	33
Is the whole nervous system formed at the same time ? . . . .	35
Is the doctrine tenable, that the white, fibrous substance of the nervous system, arises from the pulpy, gelatinous, and non-fibrous substance ? . . . . .	47
Is it true that, both in the cerebellum and cerebrum, there is a diverging and a converging system ? . . . . .	57
Converging system of the cerebellum . . . . .	58
Corpus callosum, great commissure of the hemispheres of the cerebrum . . . . .	61
Anterior commissure . . . . .	68
Unfolding of the hemispheres of the brain . . . . .	71
Conclusion . . . . .	77
Elementary principles of physiology, by Charles Asmond Rudolphi, &c. . . . .	80
Experiments on the nervous system of man and animals, published in Italy in 1819, and republished in France in 1822 : by Coster, M. D., of the faculty of Turin . . . . .	117
Experiments on the brain of the mammifera . . . . .	124
Experiments on the brain of birds . . . . .	126
Experiments on the brain of reptiles and fishes . . . . .	128
Experiments on the cerebellum in the mammalia . . . . .	128
Experiments on the cerebellum of birds . . . . .	130

Experiments on the cerebellum of reptiles and fishes . . . . .	131
Experimental researches on the properties and functions of the nervous system in vertebrated animals, by P. Flourens, 1824 . . . . .	139
Comparative anatomy of the brain in the four classes of vertebrated animals ; vol. i. by E. R. A. Serres, &c. Paris, 1824 . . . . .	185
Homogeneity, unity of the nervous system . . . . .	185
Can the function of one sense or organ, be transferred to another sense or organ ? . . . . .	194
Another discussion of the question, whether the non-fibrous substance of the nervous system gives origin to the white, fibrous substance . . . . .	202
Is the nervous system formed from the centre to the circumference, or from the circumference to the centre ? . . . . .	225
Conclusion . . . . .	237
Memoires du docteur F. Automarchi, ou les derniers momens de Napoleon, T. II, p. 29 . . . . .	239
Philosophical considerations on the moral qualities and intellectual faculties of man . . . . .	245
Of the difference between the fundamental powers and their general attributes . . . . .	246
Of perception, recollection, memory, judgment, imagination, and attention . . . . .	250
Of the moral qualities, the appetitive faculty, the appetites, propensities, and passions . . . . .	255
Of instinct and understanding, intellect, or intelligence. Have they particular organs ? . . . . .	259
Of reason, will, and free-will. Have they particular organs ? . . . . .	266
Can we find organs for the affections ? . . . . .	268
Conclusion . . . . .	269
Division of the moral qualities and intellectual faculties . . . . .	270
What are the motives of our actions ? . . . . .	271
Of the origin of the arts and sciences, and of different communities . . . . .	273
Is the human species capable of indefinite perfectibility ? . . . . .	278
Can the human species ever lose or acquire any quality or faculty whatever ? . . . . .	278
How far is the human species perfectible ? . . . . .	281
What is the world of man and of the different species of animals ? . . . . .	287
Moral precepts resulting from the physiology of the brain . . . . .	292
Conclusion, and summary review . . . . .	293
Summary Review . . . . .	307

## PREFACE.

---

HAVING omitted in this edition, the anatomy of the nervous system and of the brain, I did not intend to enter into any discussion regarding anatomical facts. But as, since my first publications, the nervous system has become the object of numerous researches, both of anatomists and physiologists, it is no longer possible to discuss its anatomy or its physiology, separately. Some maintain, that anatomical propositions are so intimately connected with physiological, that the truth or the falsehood of the former, necessarily includes the truth or the falsehood of the latter. Others, by confounding the vital with the special animal functions, pretend to have discovered the organs of the specific functions by the lesion and mutilation of the different parts of the nervous system and of the brain.

I have therefore thought it necessary to reply to the principal works, which treat promiscuously of the anatomy and physiology of the nervous system, at least so far as they are directed against my discoveries.

The works of Tiédemann, Carus, Rudolphi, Rolando, Flourens, Burdach, Serres, &c., &c., have seemed to me to be the most deserving of notice; because in them there is the most manifest intention of overthrowing my anatomical and physiological principles.

As to the comparative anatomy of the brain in the four classes of vertebrated animals, by M. Serres, I have noticed the report of it inserted in the *Archives générales de Médecine*, T. VII. 1825. At first, I supposed that the author of this report entertained the



same opinions as M. Serres; but afterwards, I saw that M. Olivier had repeated, among many other excellent remarks, several of the same observations that I myself had made against the assertions of M. Serres.

In one of the volumes, I have reproached MM. Chaussier and Adelon with having copied my ideas on the functions of the five senses, without making mention of me. It is due from me to repair the wrong which I have done to these illustrious professors; they had indicated the source of their ideas in some preceding passages.

The objections, which have been made against the physiology of the brain, since the publication of my large work, are but repetitions of those which I have so often refuted. The same may be said of those of M. Bérard, the most of which are purely metaphysical. As to the rest, his doctrine of the relations of physics and morals is a forced work of circumstances, and is consequently unworthy of the serious attention of an observer of the constant laws of nature.

I have always had a consciousness of the dignity of my researches, and of the extended influence, which my doctrine will hereafter exercise on all the branches of human knowledge; and, for this reason, I remain indifferent to all that may be said, either for or against my works. They differed too much from the received ideas of the times to be appreciated and approved at first. It required a profound and connected study to understand them: all the world, however, wishes to judge, and each one gives his opinions according to the degree of his intelligence.

My whole doctrine is now before the public. The decision cannot remain doubtful much longer. Personal considerations will disappear; the passions will be calmed, and the critic will judge of it only by its intrinsic value. Posterity will not fail to establish a parallel between the point whence I started, and the place to which I have arrived. Opponents have too well shown the state in which the different objects,

which make a part of my works were found; to make it difficult to determine the advances they have made or will make by my discoveries.

What advances in comparative anatomy, physiology, and comparative pathology of the nervous system! What fruitful source of undeniable principles for philosophical studies, for the art of selecting, deducing the good from the dispositions of individuals, for directing the education of the young! What precious materials for a criminal legislation, founded upon a complete knowledge of the motives of human actions! How different will history appear to him, who knows how to appreciate it, according to the dominant propensities and faculties of those personages, who have been its great actors, &c. &c.

The foundation of this useful doctrine is established, and it should be as firm as the facts, the materials of which it is constructed. But I am far from believing that the edifice is finished! Neither the life, nor fortune of one man, can be sufficient for this vast project. Hitherto I have depended on my own resources. But an immense number of fortunate circumstances must concur, in order to elevate this study to the degree of perfection of which it is susceptible. It is necessary to have a complete collection of the skulls of animals, not only of various species, but also of individuals in whom had been recognised faculties or qualities particularly distinct: there should be a complete collection of the brains of animals, modelled after nature in wax, in order to increase the means of comparison. A large number of skulls, or at least of busts moulded in plaster, of men and women distinguished for some quality or faculty, are also requisite: and lastly we should possess a more extensive acquaintance with natural history than we do at present, as regards the instincts, mechanical aptitudes, the qualities and faculties; in a word, as to the interior economy of animals.

It is to be hoped, that the utility and importance of

these researches may soon be generally acknowledged ; that soon a necessity will be felt of making it an object of public instruction ; that governments themselves will favor it ; that others among the learned will assist me with their knowledge, and that then moral and intellectual physiology will appear in a splendor, that my unaided efforts could not alone effect.

I had contemplated making extracts from the English works of Mr. Combe, and from the various societies which have been formed in London, Edinburgh, Philadelphia, &c. But those works are too important to be given in the small space, which I could devote to them ; nor would such abstracts have been satisfactory to my readers. Those, who read English and are interested in the physiology of the brain, will be readily convinced how much those men have contributed to its perfection.

At the time when this volume was nearly finished, a young and very skilful anatomist, M. Fauville, thought he could refute my ideas on the origin of the white fibrous substance, on the double converging and diverging system in the brain, and on the formation of the great commissure of the hemispheres. His mode of observation differs from that of M. Tiédemann, and his anatomical preparations really present a great degree of plausibility, so that those who are not familiar with the anatomy of this organ, so delicate and complicated, or those who cannot receive physiological proofs, may easily be persuaded, that the great commissure is the immediate continuation of the fibres of the corpora striata. It is for this reason, that I shall present in a single point of view, the principal arguments which prove, that the great commissure is formed by the nervous fibrils reëntering from the surface of the diverging and converging convolutions, to form this great union of the hemispheres. But the importance of these proofs will not be perceived, until the reader shall have read what I have said on this subject in the course of this volume.

I. It is evident to the eye, that the transverse bundles of the annular protuberance, or of the commissure of the hemispheres of the cerebellum, are continuations of the nervous fibrils, which arise from the surface of the lamellæ of the cerebellum, and which, by converging and uniting to those of the opposite side, form this commissure.

II. It is also in the same manner evident, that the anterior commissure is formed by the fibrils and bundles, which converge from the anterior interior part of the middle lobes. The great nervous cord traverses the corpora striata, without adhering to them in any way. Indeed, if any commissure is to be formed by the bundles of the corpora striata, it must be this one.

III. The septum lucidum, equally formed by the nervous fibrils which come from the base of the brain, and which meet in the median line of the great commissure, is but a commissure, and has nothing in common with the corpora striata.

IV. The posterior pillars of the fornix and the lyra are the result of filaments, entering and coming out of the fimbriated edge of the tœnia, and the cornu Ammonis. All these parts have no connexion with the corpora striata, but yet make a part of the great commissure.

V. No one will contend, that the anterior and posterior folds are not integrant parts of the great commissure. Now, these folds are evidently formed by the nervous fibres, which reënter converging from the anterior and posterior lobes of the hemispheres. The direction of the fibres which form these folds, is evidently opposed to the direction of the nervous bundles of the corpora striata. It is impossible to conceive this disposition, if it is admitted that the fibres of the folds are continuations of the corpora striata; every thing, on the contrary, is explained by allowing that the folds are formed by the reëntering



fibres of the hemispheres. Their direction, which is oblique and crossing that of the bundles of the corpora striata, is necessarily controlled by the width of the interrupted horizontal direction of the anterior and posterior lobes of the hemispheres. If, then, the septum lucidum, the posterior pillars, the lyra, the posterior and anterior folds, all the integrant parts of the great commissure, are formed by the reëntering fibres of the hemispheres; if all the other commissures, that of the hemispheres, of the cerebellum, the anterior commissure, are formed by the reëntering or converging fibres of the hemispheres, how can any one rationally admit, that the only middle horizontal part of the great commissure should make an exception to this general law?

VI. The great commissure, in its posterior part, is extended beyond the corpora striata, because the posterior lobes are more voluminous than the anterior, and it is the posterior lobes, which furnish the posterior third of the great commissure. If this posterior third were a continuation of the corpora striata, it could not be extended backward farther than the corpora striata themselves.

VII. The fibres of the corpora striata diverge more and more, as they proceed from their origin. This divergency ought to be perceptible in the fibres of the great commissure, even as far as its median line; but, commencing from the two folds, the direction of all the fibres of this commissure is perfectly parallel, as far as to their reunion in the median line; no tendency to divergency can be discovered. This tendency should be more perceptible towards the anterior and posterior thirds of the commissure.

VIII. The fibres of the bundles of the corpora striata are stronger and of a firmer consistence; those of the great commissure are more delicate and softer.

IX. In the fœtus, the great commissure is formed from before backwards, for the anterior lobes are the

first to appear. If it were the continuation of the corpora striata, it should, like those bodies, be formed from behind forward. They exist even when there is no appearance of the great commissure; while, on the contrary, this commissure commences at the same time with the hemispheres.

X. The two folds being thicker than the rest of the great commissure, evidently prove, that they have gained an increase of medullary fibres, which cannot be conceived on the supposition, that they are the continuation of the corpora striata.

XI. The posterior fold is much thicker and more furnished with nervous fibrils, than the anterior. This fact is explained by the greater volume of the posterior lobes, which consequently furnish a greater number of fibrils to form this fold. If the two folds were a continuation of the corpora striata, this difference of thickness could not be accounted for.

XII. For a long time, anatomists could not explain the great quantity of the white substance of the hemispheres, by the bundles of the corpora striata only. But this increase of the white substance is conceivable, when it is admitted, that the grey substance of the surface of the hemispheres, furnishes the other half of it. And as throughout, the grey substance produces the nervous fibrils, it is conformable to the universality and constancy of the laws of organization, that the same should be true of the grey substance, which is not fibrous, which covers the external surface of the cerebral membrane.

XIII. Lastly, if the great commissure were a continuation of the corpora striata, it would be impossible to explain phenomena seen in hydrocephalous subjects, as the unfolding of the hemispheres, their extension into a large bladder, without any rupture, and often without any remarkable injury of the functions of the brain.

These arguments henceforth ought to be sufficient

to demonstrate the weakness of the attempts of certain anatomists, to deny the reëntering converging system, and the formation of the great commissure agreeably to it.

## FUNCTIONS OF THE BRAIN.

---

THE ANATOMY OF THE BRAIN, *containing the History of its Development in the Fætus, with a comparative Exposition of its Structure in Animals*: by FREDERIC TIEDEMANN, &c.: Translated from the German by A. J. L. JOURDAN. Paris, 1823.

M. JOURDAN has prefixed to his translation a preliminary discourse, and M. Boisseau, in the *Journal Universel des Sciences Medicales*, Vol. xxx. p. 309, has complimented both. It is asserted by these learned writers, that the observations of Tiédemann have refuted the principles, established in my anatomy and physiology of the nervous system in general, and of the brain in particular. Before examining the works of Tiédemann, I shall review the preliminary discourse of Jourdan, and the report of Boisseau.

Jourdan commences by proving, that he is initiated in the mysteries of the transcendental philosophy. He tells us, that it is impossible to conceive the idea of absolutely inert matter; that activity alone exists for the idealist as well as for the realist: in a simple state for the first, who allows but one power, the *me* (le *moi*); double for the second, which supposes two, the *me* and the *not me* (le *moi* et le *non moi*); that to feel is to be sensible to a power, which fills a certain space; that the universe, as cognizable to our senses, has its origin in the conflict of an infinity of different



powers; that Kant has satisfactorily demonstrated, that both space and time, are the primitive forms of all intuition; that the words *body* and *force* express only one and the same idea, as we particularly regard its existence, either in space or time; that consequently, *to be* and *to act* are synonymous terms; that very many absurd theories, &c., would have been avoided, if physiologists, true to the wise precept of Hippocrates, had borrowed from philosophy the art of reasoning only; that the words *organization* and *life, organ* and *organic action*, express the same phenomenon, according as the one or the other is considered as acting, or as existing, or as to space or time, &c., &c.

Jourdan afterwards makes an application of these profound speculations, to the physiology of the brain, in his opinion a judicious one, in mine erroneous. After having examined many errors of the philosophers, he considers with Seneca and our own experience, that man has a greater tendency to believe on the faith of another, than to examine and judge for himself. He moreover discovers, that many cerebral parts are but little developed in some animals, whose cerebral action differs but little from that, which is seen in other animals, who have them very large; that the preëminence of man, as to cerebral action, depends not on the presence of a new part, but on the development, and more especially on the concentration (*centralization*) of those, which exist already in the lower classes of animals; that the soul is the highest degree of perfection as to sensibility, that is to say, of the nervous action itself; the active manifestation of a nervous system perfectly centralized, (*centralizé*), having for its result the development of individual consciousness, as this perfectly centralized system is but the soul itself, considered only as regards its existence in space; that this doctrine accords with the immortality of the soul; that the brain acts in time, without simultaneously manifesting itself in space; that we cannot perfectly understand it, because it is

not restricted to the two primitive and necessary forms of all intuition by our intelligence. "As it does not manifest itself to us," continues Jourdan, "in space, or under either of those two forms, which alone can affect our external senses, we can only acquire a confused notion of it by our internal senses. But, although this notion may be confused, it does not necessarily follow, that it should be erroneous. Therefore," adds Jourdan, "in my opinion, we may, by the light of reason alone, arrive at an intuition of existence purely intellectual in all nature, of a principle superior to matter, the bonds of which there is so great a tendency in us to separate. It seems to me, then, that we arrive at a certain point in conceiving intelligence as the product of centralization of a nervous system, whose sphere of action augments as the more intimate harmony is established between its different parts. In this way, a superior man disseminates the influence of his genius, and extends its power over vulgar minds, which it subjects to its control. Thence arises the force of opinion, that immovable rock which withstands all the effects of physical might, of that opinion which made Tiberius tremble in the midst of his satellites, and in those recesses where he had shrouded his crimes and his fears."

It is in this manner, that Jourdan wishes psychology to be regarded, and his whole preliminary discourse abounds with such incoherences, such exquisite taste, such sublime thoughts, such connected ideas, such severe judgments, &c. But the intelligent principle of Jourdan is not exhausted by these efforts. He resorts to Kantism, and whether he talks sense or nonsense, I am ready to respond for his entire innocence; and I shall now show how, by the most singular evasions, he comes to his principal point, the refutation of my physiology of the brain.

"The doctrine of the plurality of the faculties, and consequently of the cerebral organs, is in my mind inadmissible. It is denied, from a false application of

the principle, that one organ cannot, at the same time, perform many offices."

The doctrine of the plurality of the faculties is not deduced from any principle ; it is the result of observation only ; it is the observation of the diversity of instincts, propensities, and talents of men and of animals ; the observation, so confirmed and constant, of the exterior indications corresponding to the varied forms of brains, which has confirmed the belief, that the various parts of the brain are appropriated to the different faculties ! If Jourdan reads my works, he will there find, in a thousand instances, these same proofs, and no longer be disposed to judge a cause before knowing its merits.

Jourdan reproduces all the objections, which he might have found answered in my writings.

Thus he says: " We cannot perceive any real difference between the objects, designated by Gall as fundamental faculties. They are the developments of the same activity, dependent on the perfection of the brain, or, in other words, on the addition, not of new parts, but on an increased quantity of cerebral substance."

According to the transcendental philosophy, the functions of the various senses are only modifications of one and the same sensibility. Nevertheless, nature has given a different nervous apparatus for each of these functions. If Jourdan finds no real distinction between the talent of poetry and the propensity to propagation, between the memory of places and the genius of induction, between the talent of music and that of construction, how can he explain why the monkey and the goat do not compose poems ? why the swallow and the stork are not philosophers ? or why the hog cannot sing like the nightingale ? All these ideas being fully refuted in my works, it is useless to enlarge at this time upon the subject.

The *centralization* of the brain has become the favorite theory of Jourdan, Bérard, and their associates. It is

unfortunate for French glory, that this is not of French French origin. How! so sublime a discovery, so fruitful in results, and sprung from a foreign soil! Jourdan, Bérard, and their associates, have borrowed it from Carus, Carus from Okem, and all the transcendental metaphysicians of Germany have conceived it *à priori* in their sublime constructions of the universe. Let us unite our efforts, to transplant these brilliant discoveries to the schools of Paris and Montpellier. Why should they any longer trouble themselves to find the measure of intelligence in each species of animals, and in each individual? By a happy idea, the mass of all the faculties is thrown into the same bony boxes (*boites*). Weigh the contents of these boxes, weigh the brains, and you will have the intelligence of a grain, of an ounce, from one to three pounds, six pounds, always in the proportion of the cerebral parts centralized to one simple mass, equally uniform as to its existence, as to its dynamic activity, its existence in space, and its activity in time. It is, therefore, no longer a question but of the *plus* or *minus*, and the *minus* or *plus*.

The carp will build somewhat like the beaver, and the beaver will build at least a thousand times better than the bee; the sheep will kill as much as the wolf, and the elephant will be twenty times more murderous than the tiger; the frog will sing like the nightingale, which will be two thousand times surpassed by the wild boar; the dolphins and porpoises will make as much better philosophy than Jourdan and Bérard, as the centralized mass of the brain of these learned men, is exceeded by the cerebral mass of these metaphysicians of the ocean.

As to the passage which Jourdan quotes from the work of Georget, I have also done the same, and replied to it in the fifth volume of the octavo edition, p. 523.

"Add to these difficulties," continues Jourdan, "those which are presented by the limitation of dis-



inct faculties in the midst of a mass, whose substance is every where continuous." An objection, which Jourdan will find answered in vol. II. pages 380, 383, and 391.

According to Jourdan, the objections are increased, in proportion as the hypothesis of the plurality of the cerebral organs, is taken into consideration, without mentioning the discordance between Gall and Spurzheim, the first of whom counts but twenty-seven organs, while the latter admits thirty-five.

Neither Spurzheim nor myself have ever definitely limited the number of organs; we both agree as to those we have both admitted; and if, at some future time, Jourdan should discover a new organ, by observations founded on a great number of positive facts, and on comparative anatomy and physiology, he will have the merit of having added to the perfection of the physiology of the brain. Here again, I refer him to some late details in my works, and more especially to vol. III. page 15, 4to. edition.

"It is necessary only to examine without prejudice each of these pretended faculties, to discover that they are all very complicated, whereas a faculty should be simple." Indeed, if you decide the faculty of the instinct of propagation, the love of offspring, of attachment, of self-defence, to be all one faculty, then you have faculties very complicated. All that Jourdan says of the instinct of self-preservation, of the propensity to govern, of the love of glory, is but the repetition of the same ideas which have been refuted in each treatise on a fundamental faculty, and, in particular, in the replies made to the objections of Demangéon. The views of Lamarck regarding habit, have been more amply discussed than they merit, in vol. I. p. 155.

As to the results of education, which Jourdan but so imperfectly understands, in case our faculties were real, how can he understand that the eyes of the painter, the ears of the musician, the tongue

of the wine-taster, receive an education? The sight, the hearing, the taste, are not these real faculties?

“In surveying the long series of animals provided with a brain,” M. Jourdan says, “we observe the circle of the intellectual faculties increase, in proportion as the hemispheres of the brain advance towards the cerebellum, which in man finally terminate by covering it entirely. Is it then credible, that the anterior part of these same hemispheres, has the privilege of concentrating in itself the most noble prerogatives of intelligence; since this part is that which is the first developed? And without attaching more importance to the posterior than to the anterior lobes, is it not exceedingly probable, even certain, that their appearance is connected with the most complete development of the encephalon, and consequently of the mind; since otherwise it would have been sufficient to produce a more extended intelligence, to have given to the anterior lobes alone a greater amplitude or thickness?”

This objection proves, as M. Jourdan says, that man has a greater tendency to believe on the faith of another, than to examine and judge for himself. When on the subject of the love of offspring, I demonstrated, that it was not true, that the posterior lobes were wanting in animals, which, as regards intelligence, are placed below man. Many animals, as the elephant, the dolphin, and apes, have the cerebellum as much covered by the posterior lobes, as man. I have shown, that this error of Cuvier, Tiedemann, and Carus, has its source in the position more or less horizontal or vertical in animals. In all females, the posterior lobes are more developed, more completely covering the cerebellum, than in males. From this, it should follow, that women excel men as to the noblest faculties of the intellect. If I desired to reason on this point, I should say, that the posterior lobes, as well as the cerebellum, were developed at a later period, because they are the organs of propensities, which are manifested much later in life, than the faculties of

intelligence. If M. Jourdan could be persuaded to read, what I have said upon the signification of a large or small development of the forehead, he would be convinced, that he never would have made this objection, if he had known my works. It is rather a great part of the middle lobes, which are wanting in herbivorous animals, as I have demonstrated by comparing the brain of a calf with that of a carnivorous animal. Vol. iv. p. 76.

"If we pass," continues M. Jourdan, "to other difficulties, our doubts will still increase. Let us admit for a moment, the opinion of Gall as to the structure of the convolutions, *although it may be apparent at this day*, that it is false and founded in a great measure on an erroneous theory of the hydrocephalus internus: we must then attribute different faculties, either to various parts of the length of the same fibre, or to the bundles made up of these fibres. The absurdity of the first supposition is very evident. [Why does M. Jourdan concern himself so much with mere absurd propositions?] As to the second, how is it credible that fibres of the same nature, which arise from the same point, which are in contact and are even intimately united with each other, can possess different faculties?"

If the first supposition were absurd, the second is false, as I have fully shown in many parts of my works. To recall to the reader one of these replies, is it not true, that, in the medulla oblongata, the different fibres and ganglia appear of the same nature, that they arise from the same point; (if M. Jourdan wishes to designate as a point a considerable extended space,) that these fibres touch each other, and that they are there as intimately united as in any other part of the brain, and that still they possess different faculties? Nothing is more unaccountable, than what MM. Jourdan and Bérard say of the structure of the brain. At every moment they betray the fact, that they have never dissected, nor witnessed a dissection of this

organ. Where is then this same point, from which the nervous fibrils of the hemispheres arise? Have they ever seen the hemispheres unfolded, that they dare to assert, that my opinion of their structure is false? Have they ever examined a hydrocephalic subject, where the brain has been found dissolved, instead of being unfolded? It must result from a total ignorance of all these physiological and pathological phenomena, that any one can still uphold the ancient errors with such conceited vanity.

“It is the development of this or that convolution,” continues our learned M. Jourdan, “which builds up each faculty, as Gall says. But the beaver possesses to an high degree the talent for architecture, notwithstanding his brain is perfectly smooth; whilst the seal, whose hemispheres are furnished with convolutions nearly as numerous as those of man, manifests no capacity as to ingenuity or construction. Moreover, the beaver loses his constructive talent, as soon as he quits the society of his species. There is then something besides the greater or less development of this or that portion of the encephalon, which is the foundation of the propensities and talents of man, and animals provided with a centralized nervous system. I have added this last phrase intentionally, for it appears to me incontrovertible, that the propensities and talents are both connected with a special organization, when the nervous apparatus is composed of masses either insulated or feebly united, while, at the period when this same apparatus has acquired a marked influence over all the others, its action also assumes a character of unity, which permits the predominance of a propensity or talent, only inasmuch as it has in itself more or less preponderance. Intelligence is not the noblest attribute of cerebral action, as has been said, but it is that free will, by which the highest degree of volition is manifested, and which exacts the most perfect development and centralization of the nervous system. I defy M. Jourdan to give any



rational interpretation of all the arbitrary expressions, the half anatomical, half metaphysical nonsense of the last passage. Let him first explain to me how the beaver, who, according to his statement, is still deficient in the convolutions, possesses to such a great degree the talent of architecture, whilst the seal, whose hemispheres have so many convolutions, even more numerous than man, does not manifest any capacity for mechanical ingenuity and construction; while man so often shows a passion for the mechanic arts. According to the hypothesis of the centralization, the seal should enjoy all the faculties. Some one has told M. Jourdan, that the brains of the rodentia have no convolutions, and he has believed it without further examination. If he had ever observed the brain of the beaver, of the kangaroo, and of many others of the rodentia, he would have found these convolutions; and if he had ever seen beavers when alone in a small pond, he would have learned that they do not lose that talent, which, by his statement, revives immediately when they are in company with their species. All animals in a state of captivity or wounded, suspend, at least for a short time, the exercise of their faculties, but they do not lose them. If M. Jourdan had read my works, he would have found the reply to this objection, vol. iv. p. 145.

The following is a similar fact that M. Geoffroy Saint Hilaire has had the kindness to communicate to me.

“There has been at the Menagerie du Jardin du Roi, for several years, a beaver. He is not of the social species like the beaver from North America, he is of the species of beaver of the Rhone, who live alone like water rats. Nevertheless, after what I have witnessed, it is evident that animals, when constrained by a new position, can find in their native qualities resources, which they can oppose to unexpected contingences.

“Our beaver at the Menagerie occupied an apartment which was never warmed. In the winter

season he was furnished with an abundance of straw, and a shutter was prepared to enclose the bars of his apartment. It happened that, one night, it was excessively cold: the shutters were not made tight, and the beaver endeavoured to obviate the effects of the severe weather by all the means in his power.

"It was customary to give him at night a certain quantity of fresh branches for food. In the morning the wood was found divested of its bark. Before closing him up by letting down the shutter, they gave him in the evening fruit, carrots, apples, &c.

"It had snowed, and the snow had accumulated in a corner of his apartment.

"These were all the materials, which the beaver had to make use of, to build up a wall to defend him from the cold and the external air.

"He twisted the branches of the tree among the bars of his cell. This was done precisely like basket work and with great symmetry. The branches thus interlaced, of course left little spaces which the beaver filled up with the carrots, apples, and straw. Each of these was cut, so as to correspond to the opening which it was required to close: and lastly, as if the animal had comprehended the necessity of covering it all with a more compact cement, he used the snow to fill the very minute spaces. The wall protected two thirds of the aperture, and he used all that had been given him in constructing it.

"It happened in the morning, that the snow, being frozen between the branches and the side of the shutter, the last adhered to the newly built wall. The shutter, however, being raised, disclosed in this manner, the wall which had been built by the beaver.

"The attendant was so astonished at this unexpected construction, that he came to me immediately without having deranged it.

"In stating the above to Dr. Gall, I have only given that which I witnessed myself."

If M. Jourdan had had even the most superficial

knowledge of the physiology of the brain, he would not have said that this or that convolution established this or that faculty. He would have said, that such a cerebral part is the organ of such a faculty, and that this faculty is the more energetic, as this cerebral part, whether it be smooth or folded into convolutions, is the more developed.

Let M. Jourdan point out to me the animals, who are provided with a *centralized* nervous system. I designedly use this term. At what period can one admit, that the cerebral parts are still enough isolated, in order that each should be connected to a special function? What is the extent of this isolation? At what distance should the nervous bundles be separated from each other? Are they sufficiently so in the medulla oblongata, in the annular protuberance, where no distinct separation is perceptible, and whose functions are so different? or are they centralized, as the advocates of centralization suppose? In what species of animals does this centralization commence? How happens it, that in man, in whom, according to your notion, this centralization is the most perfect, there is, in almost every individual, some propensity or talent, which predominates? Great architects, musicians, mathematicians, poets, voluptuaries, philosophers, &c., have then the misfortune of not possessing a centralized brain!

And as to the brains of porpoises and of elephants? let M. Jourdan show me there, the difference between them and that of man! Why do not these animals enjoy in the highest degree the self will of M. Jourdan? Centralization then is a word without sense, not founded on fact, a chimera, a monstrous offspring of the transcendental philosophy, begotten and adopted by Messrs. Jourdan, Bérard, and company, to serve them as a defence against the irresistible proofs of the plurality of the cerebral organs.

We come, at last, to the definitive judgment of M. Jourdan, as to the physiology of the brain. "If I

reject," he says, "the doctrine of the plurality of the intellectual faculties and the cerebral organs, which appears to me untenable, I do not think that there exists, even in man himself, various degrees of intelligence, corresponding to as many conditions of the brain, which produce marks of their existence on the skull, and of which the *general* form of the cranium becomes a sufficiently accurate index."

Is it to be credited, that this avowal has been drawn from M. Jourdan, from a slight attention to the different forms of the crania of men endowed with various degrees of intelligence? This redoubtable adversary understands German, and has read the concluding pages of M. Carus, from 310 to 311, which he has faithfully copied, without making the least mention of M. Carus. In the poverty of his resources, and in the security that few of his countrymen would detect his plagiarisms, he is modest enough to make a display, even of the very blunders of another. He continues, by making use of the passage from M. C. J. Carus. "But I am persuaded also, that it is with craniology as with physiognomy; and as it would be absurd to attribute idiocy to large lips or to a prominent chin, because these are often observed in the physiognomy of persons of dull minds, it is not less so to connect different degrees of intelligence with any prominence of the encephalon and its osseous covering, which, perhaps, may be noticed in a certain number of individuals, who might possess it in a degree more or less remarkable. The doctrines of Lavater and Gall rest on the same foundation, on a *petitio principii*: they must share a similar fate. We are authorized in the belief, that, as there exist in the human race as many modifications as individuals, and as the different degrees of organization remind us of those cases in which nature established, and permanently adopted in some of the inferior vertebrated animals, the general formation of the human head, should express a character resembling that, which is found in



these same animals, according as the cerebral organization, or, which is the same thing, the intellectual dispositions of the individuals, approach those which characterize them. It was in this light, that Porta\* wished physiognomy to be considered, and certainly it would be more profitable in the results than the arbitrary methods of Lavater and Gall."

Here is an eminent example, where it may be well said, that the dead destroy the living. Whenever I shall wish to be admired, extolled, and even have my follies applauded, I will drown, hang, burn myself, to ensure death; and if, notwithstanding these means of destruction, my *moi* remains still condemned to employ itself in the affairs of my *non moi*, with the inanities of the world in *space*, I wish, at least, to have places and titles to bestow in *time*.

I have read both Porta and Huart.† I earnestly wish that M. Jourdan should enrich French literature with those interesting productions. They are embellished with engravings, which are very convincing of the truth of the physiologico-physiognomical principles, such as human heads of both sexes, with the jaws and ears of an ass, and foreheads like the Spanish rams, &c., &c. We read, (the page I cannot now recollect): "Those, whose foreheads are retreating, compressed, narrow, and similar to the vilest ape, are wicked, perfidious, mimics, liars, boisterous: those, with the beak of a magpie, are thieves, plagiarists, boasters: those, with large eyes and round ears, resemble rats, and are compilers: those, with sharp noses and scarcely any eyes, like the mole, they are taciturn and act by stealth." And an infinity of such things are found in those authors, equally worthy the consideration of our most renowned physiologists. I cannot conceive how I

---

\* *De humanâ physiognomoniâ*, B. Portæ Neapolitani; lib. iv. qui ab externis, quæ in hominum corporibus conspiciuntur signis, ita eorum naturas, mores, et consilia demonstrant, ut intimos animi recessus penetrare videantur. Haver, 1593. (*Note by M. Carus.*)

† Ueber die Prüfung der Kæpfe.

could so far have forgotten the previous lessons of Porta and Huart, as to have written in vol. iv. p. 284, of my large work, and vol. v. p. 429, of the octavo edition, a treatise on physiognomy and pathognomy, in which I have urged the absurd idea, that there is some difference between the signification of an aquiline or flat nose, large or contracted lips, and a defect or development of a part of the brain: lips impart to us the delights of a kiss; all the world is aware of the great advantage of a nose; but of what use is the cerebrum and cerebellum? at most, (the discoveries of the new physiology lead to that belief,) but to serve to make the miserable race of man walk forward or backward.\*

*Journal Universel des Sciences Medicales*, vol. xxx.  
p. 309.

Let us now attend to the opinion of M. Boisseau, on the work of M. Tiédemann, and the preliminary discourse of M. Jourdan.

M. Boisseau says, p. 311: "In reading the work of M. Tiédemann, published in 1816, we shall be astonished, undoubtedly, to find in it a remarkable resemblance to the work of M. Serres, announced since 1822, at least judging of it from the report of the illustrious perpetual Secretary of the Royal Academy of Sciences. We make this remark the more willingly, because no one will deduce from it any conclusion unfavorable to M. Tiédemann, who could not foresee, who could not anticipate, (as it is now seven years since,) that that, which he had discovered already, would be, some years after, discovered by one of our associates."

When nations make war, pillage is justifiable. Now

---

\* The discoveries of the functions of the cerebrum and cerebellum, are well known, viz. that the first is destined to make the animal walk forwards, and the last backwards.

the learned, who are bent on discoveries, are constantly at warfare with each other ; therefore, they should have the right of plunder, and, in this respect, the low malice of M. Boisseau is truly national.

It matters not, whether it is M. Tiédemann who has plundered M. Serres, or M. Serres, M. Tiédemann, or M. Tiédemann, M. Carus, or Messrs. Carus and Tiédemann, Messrs. Gall and Spurzheim ; the facts remain ; the world, the common country of the learned, loses nothing. It is thus, that a few years before the publication of my large work, I taught in my lectures, that, according to a great number of experiments, the medullary fibres, remounting from the genital parts along the spinal marrow, as far as the cerebellum, decussate like the anterior pyramids. I have recorded those same observations and the same deduction, in the third volume, p. 115, in 4to., printed in 1818. Since the end of September, 1823, Messrs. Serres and Flourens have disputed the priority of this discovery. It then follows, that I have seized the property of these two experimenters. My criminality has been known to them for several years ; for, M. Flourens has himself inserted some articles on this same work, in the *Revue Encyclopédique*, September, 1819, and March, 1820. But, instead of finding fault with me, they have substituted another purloiner instead, who has been, at least, two hundred years guilty of non-appearance. The most of those authors, who have written since the publication of my works, and who have treated of the same subjects, have exercised the same kindness towards me.

M. Boisseau cites a few anatomical facts, some of which accord with my views, and others are in opposition. I shall reply to them all, after having first explained the ideas of M. Boisseau, who continues :

“ The reader will not do justice to the merit of the work of M. Tiédemann, from so slight a sketch ; he has only seen, that, to judge of the anatomical system of M. Gall, it is necessary to be acquainted with the

labors of his celebrated associate. M. Tiédemann endeavours to refute it in many particulars by facts, which overthrow his principal anatomical propositions ; it is known that, unhappily for his physiological opinions, M. Gall pretends, that both are so connected, that the first cannot be refuted without destroying the last. It is for him to defend himself against an attack directed to the very foundation of his doctrine ; it is surprising, that, since 1816, he has not attempted it, and more astonishing, that, in 1817, the work of M. Tiédemann was known in France, by an analysis of M. Jourdan, in this journal. The author announces that he has the brains of fœtuses of every period, to convince, if necessary, those who might be incredulous of what he has advanced. 'I think,' says he, 'this method indispensable at a period, when, unhappily, things are described and figured, of which nature never has furnished a model.' We agree with the translator, that the work of M. Tiédemann is one of the most remarkable which has appeared for a long time ; uniting it with that of M. Chaussier, on the encephalon of the adult, it forms an anatomical monograph of the human brain."

This passage gives me an opportunity to make several elucidations, which I will render at the same time instructive. To judge correctly of my anatomical system, it is proper to know the excellent work of M. Tiédemann ; it is well to know also the works of all those, who have written and are writing on the same subject ; it is, above all, indispensable to understand my method of examining the brain, and my discoveries. But it is not sufficient to know, that one author says no, or that his predecessor has said yes. If individual authority is to determine it, I think myself as much entitled to this right, as any one else. No one has examined so many brains as M. Spurzheim and myself. All our predecessors sliced this noble organ into a thousand pieces, and were satisfied with making mechanical and minute descriptions of its different



parts. I put myself above all authority. I have broken the ice, and have established a method of philosophical and physiological dissection, founded on the gradual perfection of animals, and on the laws of the organization of the nervous system. Every day experience proves that, whenever this method is abandoned, uncertainty and error are the sure results. At one time, for example, a part derives its origin from a superior part, and is directed towards an inferior part; at another time, the reverse. Sometimes, the ganglia are simple enlargements, at another, they are the apparatus of reinforcement; now these same ganglia are placed at the commencement of the nervous apparatus; at another, they form their completion; sometimes, the gelatinous, or non-fibrous substance, gives origin to the white fibrous substance; and sometimes, this has an independent origin, &c. &c.

We have repeated the same experiment hundreds of times, to dispel the doubts which still remained in our minds; while M. Tiédemann, according to his confession, has only made his dissections on the same object two or three times. And when, after multiplied examinations, we could not sustain a particular opinion, we have frankly avowed it. Lastly, those only, who have never made examinations of brains, cannot believe, that a certain preparation, such as the maceration in alcohol, the boiling in oil, can render the parts so distinct, that the anatomist can trace, without interruption and without rupture, the origin, continuation, reinforcement, the peripheric termination, or final distribution of the nervous fibrils. I shall prove, that M. Tiédemann is often mistaken, even in things the most distinct, and that very often he has determined with precipitation, points, which apparently will for ever remain undecided. Is it, then, astonishing, that he reproaches us with having described and figured things of which nature never furnished the model? He says, to prove the accuracy of what he advances, he preserves the brains of fœtuses of every

month. We have done more; we have dissected the brain before thousands of witnesses, before anatomists the most skilful in the investigation of the organ, such as Reil, Loder, &c. We have made this dissection, as well in our public as our private lectures; and I invite all those, who wish to know the truth, to witness this same demonstration; I will do it as many times as they deem it necessary. After that, they may determine if our engravings of the brain are not conformable to nature. Undoubtedly those, who have never seen the unfolding of the hemisphere, and the two orders of nervous fibrils, diverging and converging, cannot comprehend, and do not succeed in making those preparations. M. Spurzheim and I are no longer alone; there are already a large number of young anatomists, who are perfectly competent to defend our discoveries against all attacks, and this number is daily increasing, by the lectures which we are constantly delivering. If Messrs. Tiédemann and Carus had attended one of these lectures, they would have united their assent with that of M. Loder and Reil; and they and Messrs. Jourdan and Boisseau would be convinced, that, to form an anatomical monograph of the brain, they must rectify many of their opinions, as already we have shown many errors in the work of Chaussier.

Let us rectify another error of M. Boisseau. This savant represents me as asserting, that my anatomical and physiological opinions are so united, that the first cannot be destroyed, without, at the same time, demolishing the last.

I used the following expressions on this subject, in our reply to the report made by the committee of the French Institute, on our memoir, presented to this learned body the 14th of March, 1808,\* p. 244, &c.

---

\* *Researches on the nervous system, in general, and the brain, in particular*: — Memoir presented to the French Institute, followed by observations on the report, made to that body by its committee.

After having shown, that there are but few cases, where the structure of parts designate to the anatomist, the functions which depend on them, I say :

“ We must have recourse to other means. Usually the knowledge of functions precedes that of structure. It certainly is not necessary to understand the structure of the eye, or the organization of the optic nerve, in order to know that it is the organ of vision, &c. It is without anatomical dissection, that we ourselves have made most of our physiological discoveries; and these very discoveries might have existed for ages, without their correspondence with the structure of the brain being perceived. On the other hand, supposing that the knowledge of the organization had preceded that of the functions, it would have given rise sooner or later to conjectures, which infallibly would have been stamped with the prejudices of the age. Formerly, the seat of courage, love, sympathy, and cruelty, was placed in the heart; and after the same manner, the liver was assigned as the organ of anger and sensuality. If anatomy had been an unerring guide to the knowledge of the functions of the different parts, would Willis have caused the *vital spirits for motion to be secreted in the cerebellum*? Would Galen have attached the organ of smell to the anterior ventricles? Would the soul, alternately dislodged from the pineal gland, the corpus callosum, the annular protuberance, &c., have been placed by Sœmmerring in the vapor of the ventricles, and by Ackermann in the medullary substance, which lines the interior of these cavities, &c.? Would the memory have been placed in the grey substance, and the judgment in the medullary substance, of the hemispheres?

It might be expected, that anatomists, seeing the great diversity of the constituent parts of the brain, would have been the first to have deduced from it the diversity, and consequently the plurality, of the organs of the intellectual and moral faculties. But

when we observe that, even at this time,\* Vicq-d'Azyr, after having made up the parts of the human brain, by ascending from insect to man, and afterwards analyzed it by passing from man down to the insect, has still admitted only a single organ of the soul, we are taught by experience, how very little the mere knowledge of a mechanical structure avails the physiologist. It is only by observing the phenomena of nature, regardless of the prejudices or vagaries of any metaphysical system whatsoever, that we can attain a correct knowledge of the structure of the brain, and of the nature of its functions. Herder, struck with the phenomena of the understanding in the various animals and in different individuals, conceived the idea of a plurality of intellectual organs, and even the hope of some day discovering them, by an attentive comparison of their brains with their peculiar qualities.

“A vast number of physiological and pathological facts should be collected, embracing many years, before any rational deduction can be made, as to the laws of the organization of the brain and the nervous system generally. But what could be the use of all these facts, if we had not previously supposed, that there was an intimate and necessary connexion with their material conditions? It is in this manner, prepared by physiological and pathological observations, that we have made, in a short time, discoveries, to which the scalpel would never have led us. And it is precisely the perfect accordance of intellectual phenomena with material conditions, which ensures a lasting duration of our anatomical and physiological doctrine of the brain.

“To say that the discovery of the functions of the brain is made independent of the knowledge of its structure, or that these functions have no immediate and necessary connexion with its structure, is a very

---

\* And again that even now the metaphysical physiologists see in all these parts but one centralization of a single organ.



different thing. Can any one advance that motion and secretion have no relation to the organization of the muscles and viscera; and that digestion and the circulation of the blood have not an inseparable affinity with the stomach and the heart? &c.

“A doctrine of the functions of the brain, if it is in contradiction with its structure, must be necessarily false. If it be proved, that the brain is composed of glands, a secretory or excretory organ, it then is incapable of any superior function, and is to be classed with the other viscera. If it be a central point, where all the medullary fibrils which are found in all animals, can be demonstrated, notwithstanding their various and more or less numerous faculties; a cerebral mass always similar, then the plurality and diversity of the organs is overthrown. Whoever can show that the brain is only the origin or the central termination of all the nervous systems, will also have proved, that its functions are similar to those of other nerves. If a constant and invariable identity, in the constituent parts of their brains, can be proved to exist in different individuals of the same species, notwithstanding the gradual difference of their common faculties, then it would be impossible for us to assign their localities to organs, by comparing the predominance of their physical development with the predominance of their psychological energy. It is in this way, by placing the principal points of our psychological doctrine in direct opposition with the organization of the brain, they would destroy its foundations and annihilate it with all its conclusions. But, if it be true, that the constituent parts of the brain, from insect to man, are multiplied and vary in the same relation and proportion as the faculties; that all facts go to prove that the extraordinary energy of one faculty corresponds to an excitement or to an extreme development of some parts of the brain; that the derangement of a faculty is caused by the lesion or the disease of a cerebral part, in the same way that the pain or the

loss of a sense is connected with the lesion or the disease of its physical apparatus ; if, lastly, it is true that the brain is composed of a nervous system, different from all others, and divided into many other systems so distinctive, that the diversity of their origins, their bundles, their directions, their terminations, their points of union, may be demonstrated to the eye ; then it is a fact, that the anatomy of the brain has an intimate connexion, and is in perfect accordance with the doctrine of its functions."

These passages, the substance of which has been repeated in several places of this edition, should have taught M. Boisseau, that the physiology of the brain has never been predicated on its anatomy, and that I have never maintained as facts, that the gelatinous substance is the nutrient matter of the nerves, nor as to the diverging and converging fibrils of the hemispheres ; the principal points which Tiédmann and his followers pretend to have refuted, and the reality of which I shall soon show.

It is true, that we explain, by the duplicatures of the convolutions and their unfoldings, that the intellectual and moral faculties continue in hydrocephalous cases, which is denied by these gentlemen. As they have never witnessed this unfolding, and as apparently they can render no solution of this phenomenon, they have passed it by in affected silence.

M. Boisseau finishes his review of the preliminary discourse of M. Jourdan by a very lofty eulogium. "This discourse," says he, "presents a very happy application of the German philosophy, divested of its obscurities, to the physiology which is the boast of the French school."

If ever M. Jourdan succeeds in divesting Kantism and its excrescences of their obscurities, *magnus mihi erit Apollo*. When M. Boisseau quotes the pride of the French school, does he allude to the concentration of all the parts of the brain in one single organ ; to the large base of M. Lamark ; to the masks

of monkeys, tigers, sheep, and owls, of Porta, Huart, and Jourdan? In short, I am of opinion with M. Boisseau that M. Jourdan, although very often inexact, is, however, a tolerable translator. He would do better to confine himself to his vocation, to furnish us translations, but not to write a preliminary discourse.

*ANATOMY OF THE BRAIN, containing a History of its Development in the Fœtus, with a comparative Exposition of its Structure in Animals : by F. TIEDEMANN : Translated from the German by A. J. L. Jourdan ; with 14 plates. Paris, 1823.*

I have in another place commended the works of Messrs. Carus and Tiédemann. If M. Carus had not encumbered his positive knowledge with the bombastic transcendental philosophy; if his inflated style, his accumulated participles, and gigantic phrases had not at every moment put the attention of his reader to torture, he might have been regarded as the origin of the work of M. Tiédemann, which is much better written. I have a high opinion of the merit of these two authors: I much prefer the nature of their researches to the barbarous and fruitless mutilations of our young physiologists. But, certain authors, who are not more capable of determining the errors than the truths of the anatomy of the brain, pretend to discover, in the researches of M. Tiédemann on the brain of the fœtus, not only a refutation of our anatomical discoveries, but also of all the doctrine of the functions of the brain and its different parts. It is apparently under this pretence, that they oppose to me my two estimable countrymen, and compel me to my defence. I accept the challenge, when the interests of truth are at stake.

*Advantage of Comparative Anatomy.*

M. Tiédemann justly insists on the great advantages to be derived from comparative anatomy, in order to understand the structure of the brain. "Comparative anatomy," he remarks, "explains to us the origin and successive formation of the nervous system and the brain, from the most simple to the most complex of animals, and to man. There is no apparatus of organs, in the formation of which so perfect a gradation, from the simple to the complex, is found, as in the cerebral and nervous system, which is established on a uniform plan in the whole series of animals. It is by studying the gradual composition of the structure of the brain in animals, that we attain a distinct idea of an organization, so complicated as this viscus in man, and thus we finally can comprehend the arrangement and connexion of its parts.

This is precisely one of the principles I adopted, in the study and exposition of the anatomy of the human brain, and which, since the publication of this work, has served as the basis of so many other anatomical treatises, and among others of those of Messrs. Carus and Tiédemann, &c. But M. Tiédemann accuses me of having only described and figured, in relation to the nervous system of animals, the nerves of the caterpillar, and the brain and the spinal marrow of the hen and some of the mammalia; and he thinks, that no axiom relative to any point of anatomy or physiology has any foundation, when it is not ingeniously deduced from *all* the facts and observations, having any relation to the object in question. M. Jourdan makes M. Tiédemann say, *of all the facts*, which would for ever preclude a knowledge of the anatomy of the brain. M. Tiédemann speaks only of a very great number of facts as necessary (*ans der Fülle der Thatsachen*), which is much more reasonable. At the time when M. Tiédemann published his work, he could have



known the contents of my first volume only, which contains the anatomy of the brain. But if he had read it attentively, he would have found that, in many places of the text, the comparative anatomy of many animals is alluded to, without designating all these particularities. My design was not to publish a complete comparative anatomy : I only wished to make use of as much as was necessary to establish certain and immutable principles, as to the laws of the organization of the nervous system, in general, and the brain, in particular. This I accomplished ; for, all that I have seen since in the brains of different animals, and all the recent works of other authors, on the same subject, have not overthrown one of these principles. As M. Tiédemann is no less persuaded than myself of the uniformity of the plan of nature in the formation of brains, why are such an infinity of facts necessary for him to make deductions of general laws ? What would be the exact number required, for an anatomist to establish an axiom or a principle ?

After these reflections, I hold it of much greater importance for me to apply the comparative anatomy of the brain to its physiology, than to the simple descriptive anatomy. There are found, therefore, at the exposition of each organ, numerous observations on the difference of the human brain, when compared with the brains of various species of animals, and with each other. For a long time I have been convinced of the same thing, that M. Tiédemann has just remarked, that “ we need a comparative psychology, in order to understand the uses of the constituent parts of the brain ; that it is required also, that the phenomena of the cerebral action should be carefully observed, from the lowest rank of animals to man, and that afterwards they should be compared with the structure of the organ itself. This comparison of the actions with the organization of the brain, in the various animals, will unfold to us the functions of each of its parts.” As M. Tiédemann adds that, even now we are defi-

cient in such knowledge, it may be the case, that he may have wholly forgotten the lectures that I gave at Heidelberg, and in nearly all the universities of Germany, and that he has not read any of the multiplied extracts, which have been made by MM. Froriep, Walter, Bløede, Ackermann, Muller, &c. &c., nor even the whole of the first volume of my large work.

Undoubtedly this method would be efficacious, if it were practicable; but we must first have an exact idea of the mechanical aptitudes, instincts, propensities, and talents in general, and of the moral qualities and intellectual faculties of animals and man. The connexion between the actions and the structure of the brain, which is not founded on the physiology of that organ, will be of no advantage to any philosophy. This method would be absurd in any system, which admitted only a single faculty, infinitely modified; which gave to all the cerebral parts the same function; where it is even overlooked, that in the different species of animals, the masses of the brain equal in weight and volume, should necessarily have a peculiar structure, and, consequently, functions totally different. All comparative anatomy and physiology is at fault in the supposition, that the weight and volume of brains are the standard of the number and energy of their functions; or, in other words, that the functions are as much more in perfection, as the mere voluminous cerebral masses constitute a more concentrated centralization.

*Is the whole Nervous System formed at the same Time?*

M. Tiédemann says; "The history of the formation and development of the encephalon in the fœtus is another part of anatomy and physiology, which has been equally neglected until very lately. The sagacity

of Harvey had led him to the discovery of a law, the correctness of which the Germans have recently proved, and, according to which, the fœtus, as well of man as of animals, is not at first provided with all its parts, which would be only less developed; but that it commences by having a simpler form, and passes through several successive degrees of formation, before it attains its greatest perfection. Would not a similar progress take place, I thought, in the structure of the brain of the fœtus? and cannot we infer from thence the successive formation and structure of this organ, which, in its perfect state, presents so complicated an organization?"

In the report on our memoir by the Committee of the Institute of France, they say, *In the nervous system, all is formed simultaneously.* At that time I refuted this proposition at some considerable length.\* The following is another similar to it.

"Is it then certain, that in the living organism all the parts are formed at the same time, so that we can speak of a development and increase, but not of an origin, formation, and successive perfection and completion?"

"We cannot engage ourselves with the hypotheses of the theory of *preëxisting germs*, of their development or evolution, nor of generation or production so often renewed. In admitting laws, according to which an organizing tendency (*nisus formativus*) is inherent in all beings, and after which all the parts tend to form a whole, we have no occasion to have recourse to germs, generally diffusive. The crystals of salts, stones, metals, are they entirely formed simultaneously, or do they form gradually? The bud, the flower, the pollen, the fructification, the fruit, the seeds of trees, are these all formed at the same period? or, do each of these parts successively arise? If the

---

\* *Researches on the nervous system*, with observations, &c. pp. 149, 150. 1808.

lime tree and the oak extend their branches from every part; if the aquatic lizard reproduces his tail, his feet, and eyes; if the snail, his head, and the crab, his claws; who shall persuade us that, in these cases, the germs were confined and awaited their deliverance? How does it happen that, as the more or less nourishment is given to these germs, we can modify them and make them produce spontaneously leaves, branches, flowers, and fruits? How do the stamens transform themselves into petals, the pistils and capsules into stalks, and the calix, into leaves? How does the larva of the working bee become, solely by the influence of surrounding circumstances, a queen bee? The same substance, which serves as nutriment to the plant, fish, bird, dog, and man, is changed into the constituent parts of all these beings, and is transformed into seed, by which each propagates its kind; are the complete germs of all these beings and their constituent parts, contained in this alimentary substance? The incubated egg has its different periods of formation. It is natural to suppose, that the formation of the vessels precedes that of the other parts. The head and trunk are visible a long time in the fœtus, before the extremities begin to develop themselves; the intestinal canal acquires by degrees its length and development; if the osseous substance is engendered and secreted at so late a period, if the teeth, at an age so advanced, what is there to prevent the successive generation and origin of other parts? In a human fœtus of about six months, the nerves of the vertebral column, the muscles of the eye and the tri-facial nerves are sooner formed than the olfactory nerve, and the latter before the auditory, the optic, the pyramids, and the annular protuberance, in which scarcely any traces of nervous filaments are perceptible. The peduncles of the brain, on the surface of which the bundles of fibres are so distinct afterwards, at this time appear to consist only of a mass of gray substance; the optic thalami, corpora striata,



and the hemispheres do not contain any distinct filament, (without preparation and to the naked eye); they are discovered sooner in the posterior and middle, than in the anterior lobes, &c.”\*

Thus, as regards the successive formation of the various cerebral parts, I perfectly coincided with Carus and Tiédemann, in 1808 and 1810, and their excellent writings gave me much more gratification, as I was already familiarized with this ingenious and fruitful idea. But, without intending to undervalue the advantages to be derived from the examination of the fœtal brain in its different ages, I have always inclined to the opinion, that the study of the brain of the various classes of animals below man, is a surer method of attaining a knowledge of the general laws of the organization of the nervous system and brain. No other means would be necessary, if the opinion of Carus, Tiédemann, and several German anatomists be true, that the successive formation and development of the human brain, passes through all the degrees of formation and development of the brains of animals, always becoming less and less complicated. But some inferior animals have several cerebral parts, which are not found at any period in the brain of man. M. Carus himself has advised anatomists not to give too much weight to this supposition, so specious in theory, and so frequently false in reality.† A practical discernment is required, to obviate premature conclusions, and it is indispensable to rectify in the superior classes that, which may appear to be apparent in the inferior. I would wish, then, that the successive development of the brain should be studied mostly in the fœtus; but, to know the true structure of this organ, the continuity and connexion of its parts, the direction and the varied interlacings of its fibrils, their origins, rein-

---

\* *Anatomy and Physiology of the brain, &c.*, Vol. 1. p. 240. 1810.

† Versuch einer Darstellung des Nerven Systems und insbesondere des Gehirns, p. 262.

forcements, and expansions, &c., I should always prefer either the adult human brain, or brains less complex, but more or less analogous to it.

This preference is fully justified by the success which I have obtained, in comparison with that of Carus and Tiédemann. To judge of it from the great number of inaccuracies and erroneous results, disseminated in their works, it appears to me doubtful, if they could have discovered with any accuracy from the inspection of fœtal brains, had they not previously known my anatomy of the brain, and the principles on which it is founded. Would they not, like all their predecessors and the brothers Wenzel, have described minutely and without any order, the forms and their modifications, each little hollow, each furrow, &c. &c., instead of tracing out the continuity of the fibres, the mutual connexion of parts, their use in the vegetative life, &c. &c. ?

In order to prove, that the examination of the fœtal brain is far from being sufficient to an understanding of the structure of the parts, I will give a few examples. M. Tiédemann, when speaking of the medulla oblongata, only describes three nervous bundles on its anterior surface ; the pyramids, the corpora olivaria, and the bundles or peduncles of the cerebellum. If he had compared the medulla oblongata of the fœtus, with that of the sheep or the ox, &c., he would have perceived, that, on each half of the same surface there are six very distinct and visible bundles ; therefore, the brain of the fœtus does not in all respects exemplify the gradual composition of the human brain. The same bundles also exist in man, but they are concealed by others, which are larger in man than in most animals.

The inspection also of the human fœtal brain has not revealed to him the large transverse band below the annular protuberance, surmounted by the pyramids, which is very distinct in nearly all the mammalia, and is covered in man by the inferior third of the large annular protuberance.

M. Tiédemann assumes that the corpora olivaria constitute a bundle, which goes to form the tubercula quadrigemina, at the same time that the tubercula are in connexion with a particular bundle, situated between the corpora olivaria and the peduncles of the cerebellum. M. Tiédemann, with his critical acumen, should have been aware of his error. He has seen that the tubercula quadrigemina form already a large mass, before even the corpora olivaria exist. He might have seen that the corpora olivaria, either do not exist at all in most animals, or are scarcely visible; yet still their tubercula quadrigemina are larger than in man; as for instance, in the horse, ox, &c. With more attention, he might have seen, that the corpora olivaria are not a bundle, but a ganglion, which is seen at a later period than the bundle of the tubercles, and which produces a particular bundle which goes into the two great cerebral ganglions, the optic thalami and corpora striata. An inspector of the brain of the mole, and a perusal of our anatomy of the brain, where we have treated of the corpora olivaria, would have convinced him of it.

According to M. Tiédemann, the two anterior pillars of the fornix, produce two very thin lamellæ, which go to the inferior surface of the corpus callosum, and give origin to the septum lucidum. This is an incorrect view of it. At the anterior termination of the innermost convolution of both middle lobes, there arises a fibrous bundle, mingled with a grey substance of only a line in breadth, and which often forms a kind of band, at the anterior internal part of the great fissure between the anterior and middle lobes. This bundle goes towards the median line, proceeds onwards above the reunion of the optic nerves, immediately before the anterior commissure, is ramified and expanded on the interior border of the hemispheres into a thin membrane, and, united with that of the opposite side, forms the septum. The filaments of this nervous membrane pursue a diverg-

ing direction from below upwards, and terminate by intermediate fibres in the median line of the great commissure,\* which, divided perpendicularly in its median line, exhibits in its whole thickness the same radiated expansion, as described, p. xi.

The transverse bands or interlacings, and the interlacing in the median line of the annular protuberance of the great commissure, are wholly unknown to him. See my large work, Vol. i. p. 314, in 4to.

M. Tiédemann, always vague in his principles, takes, in pages 107 and 165, the vermiform eminences for the commissures. With what foundation? At another time, the annular protuberance is, in his opinion, the commissure of the cerebellum. When the vermiform process is single, as in birds, &c., how can it then be at the same time both cerebellum and commissure?

I cannot tell how MM. Carus and Tiédemann have conceived, that I regard the posterior parts of these tubercles, as being the roots of the olfactory nerve. "As the nervous bundles, I remark on the same page, take the same direction as those of the optic nerve, it might be supposed, that it is prolonged in the nervous layer, to which the olfactory nerve is united at the point of its separation. But this opinion seems to be contradictory to comparative anatomy, at least, in the present state of our knowledge. 'These tubercula quadrigemina are found in the dolphin and porpoise, in whom no olfactory nerve can be detected.'" Since that time, I have been convinced, that the posterior pair is a ganglion of reinforcement or of increase for the visual nerve, like the anterior. The manner, in which these two pairs contribute to vision, must be different, as, in the various species of animals, they are in different proportions; and as, even in other species, the posterior pair is either scarcely visible, or wholly

---

\* M. Tiédemann has quoted only the four last lines of this passage, taken from my large work, Vol. i. p. 313, in 4to.



wanting, although vision may be perfect, as for example in birds.

Page 176. M. Tiédemann commends the opinion of Reil, that the number of the branches of the cerebellum and their divisions, or subdivisions, increase in the ratio of the progress of the animal organization towards perfection. He adds, that, from these facts the observations of Malacarne may be plausible, by which he attempted to establish an intimate relation between the number of the laminæ of the cerebellum, and the extent of the intellectual faculties of the human race. That physician found them much less numerous in idiots, than in persons distinguished by force and brilliancy of mind. Ideas of perfection are relative. The cerebrum and cerebellum of the elephant and dolphin are more complicated, and are composed of more convolutions than the same parts in man. In the eye of nature, perhaps, they are more perfect than in man, and it should be so, if Reil and Malacarne are correct. I wish to know, how often Malacarne has repeated his observations, in what manner he has counted the laminæ of the cerebellum, and whether, at the same time, he has observed the cerebrum. The cerebrum is defective in most idiots, and often the cerebellum equally so; but I have seen many idiots, as regards their intellectual faculties, whose cerebellum had acquired an enormous development, and who were addicted to the most brutal salacity. Why, then, this ready credulity to the assertions of some, on the authority of a single erroneous observation, while experiments, a thousand times repeated and confirmed throughout the whole animal kingdom, are disregarded? Moreover, imbecility is not the result of a defective organization solely; the functions of the cerebrum may be impeded by other indispositions; for, frequently, we see idiocy with an apparently perfect organization from birth.

M. Tiédemann remarks, page 223, "that when a fresh brain is examined, of a subject of seven months,

that a difference is not so perceptible between the white and grey substance of the corpora striata, as in the encephalon of an adult, and that these bodies are formed of an uniform and reddish mass, in which many vessels are ramified. The name, therefore, of corpora striata, is not applicable to them in the fœtus."

In this instance, again, the corpora striata are not exceptions to all the other parts of the cerebrum. M. Tiédemann is well aware, that, during the period of formation, the pulpy, non-fibrous substance is more abundant than at a later period; and that, in general, the white fibrous substance cannot be visible before it is formed by the grey substance, and the great number of blood-vessels which primarily form this last. The name of corpora striata was never appropriate to these great ganglions. There were never white striated lines alternating with grey. The nervous bundles are composed of a very large mass of pulpy, non-fibrous substance, of the size of a small pullet's egg, by the union of an infinity of minute filaments which there arise, and these bundles cross this large mass, which is in fact the great superior ganglion of the cerebellum, in a diverging manner, like a fan. M. Tiédemann is only aware of the existence of a smaller portion of this ganglion, which is seen in the ventricles and called the corpora striata. He is ignorant of its larger external portion, which is directly connected with the internal, and which is enveloped in an isolated place, covered with minute convolutions, concealed by the middle lobes. Consequently, we can only discover, after having scraped the pulpy substance either in the ventricles or in the opposite side, the striated, white nervous bundles, more or less large, as the convolutions, which they form by their expansion, are more or less considerable. Usually the bundles, which take a direction towards the posterior lobes, are stronger in animals, than those which go to the smaller anterior lobes.

Page 247. M. Tiédemann says, that the brain of monkeys is larger and more arched than the brain of the marten, fox, cat, dog, hog, sheep, goat, ox, horse, hind, and the stag ; that the convolutions and anfractuositities, are more numerous, than in the animals just enumerated. The brains of the largest monkeys are very similar to those of dogs. None equal in size the brain of the horse, not even that of the ox or stag. The orang-outang's is like a new-born infant's,\* that of the chimpanse is smaller, fig. 1 ; their convolutions and anfractuositities are not near as numerous as in the hog or ox. When, with Baron Cuvier, it is said, that, excepting the chimpanse and the gibbon, we do not find convolutions on the posterior lobe, we have only to refer to the brain of the orang-outang and the guenon, Pl. LXXVII. fig. 1, to disprove the assertion. And when M. Tiédemann repeats, in page 248, that the brain of the adult man is distinguished from that of all animals, by the volume and height of the hemispheres, and by the greater number of the anfractuositities and convolutions, I refer him to the brains of the porpoise and elephant, Pl. xxxv.

Page 294. M. Tiédemann adopts the opinion of several anatomists, viz: that all animals, including even the mammalia, with the exception of the quadrumana, are destitute of the posterior lobes of the cerebrum. I have rectified this error in another place. As, by this supposition man and the quadrumana alone possess the posterior lobes, what would be the faculty or propensity that the latter have in common with man only ? This is another happy effect of the mechanical inspection of the brain, instead of attending to physiological principles.

I have already repeatedly rectified the translation of M. Jourdan. The following extract shows his intention. M. Tiédemann, page 212, compares one of my opinions with that of Reil. "M. Gall," he

---

\* Atlas of the large work, Pl. xxxiv. fig. 2.

remarks, "rightly deriving the optic nerves from the tubercula quadrigemina, considers the optic thalami as the organs of reinforcement of the peduncles of the cerebrum, and gives to them the name of great cerebral ganglions, to distinguish them from the corpora striata, which he calls the little ganglions. According to him, their use is to increase the volume of the pyramidal bundles, which traverse them, by furnishing them with cortical substance and new medullary fibres. Reil affirmed, that they formed a sort of protuberance, placed on the internal side of the cerebral peduncle, and that they serve to concentrate its fibres into a single focus or centre, whence they diverge afterwards into a great circle formed by their expansion in the whole cerebrum. According to his view, they were organs, which went to form but the fibres of these cords, which, taking a direction from behind forwards, become radiated in the posterior lobes, that is to say, he assigns for their use, the forming of the retrograde radiation, that they are the centre of the organization of the cerebral peduncles, the focus of radiation in every direction.

"None can refuse their assent," continues M. Tiédemann, "to these ideas (M. Jourdan translates, *to the ideas of Reil*), when it is recollected, that the cerebral peduncles really acquire an increase of size, in crossing the optic thalami, on leaving which, they disseminate in the hemispheres of the cerebrum many more fibres than they were composed of, when they entered them. The increase of these two cords is effected by the numerous sanguineous vessels, which cover the optic thalami, and is the result of a great separation of the cerebral substance, (*non-fibrous*,) whence new medullary fibres arise. The multiplicity of the sanguineous vessels, in the optic thalami is proved by the abundance of the cortical substance, which is formed there, and which has a texture much more vascular than the medullary substance, as all anatomists allow: this great influx of blood is evidently to permit a



greater increase of the eminences, and to communicate to them more activity, by a more abundant supply of nutritive matter."

It must be evident to those, who have read the beginning of this passage, and who are acquainted with my principles respecting the laws of the organization of the brain, that M. Tiédemann has fully adopted my views, as he must do, as a rigid observer and acute anatomist. Why does M. Jourdan insinuate, and even distinctly affirm, that M. Tiédemann has adopted the opinion of M. Reil? In fact, the ideas of Reil, so sagacious in other respects, are no way admissible. The concentration of the fibres of the peduncles into a single point, does not increase the volume; it does not aid in their expansion, which is better effected by the transverse bands, the consideration of which remains still neglected.

M. Jourdan further mutilates the text of M. Tiédemann, when he represents him as saying, that I give the name of *great cerebral ganglions* to the optic thalami, to distinguish them from the corpora striata which I call the *little ganglions*. M. Tiédemann says, in conformity to my work: "According to M. Gall, the optic thalami are ganglions to the cerebral mass, and he calls them the great *inferior* cerebral ganglions, to distinguish them from the corpora striata (the great superior cerebral ganglions)." \* The same intention is shown, p. 229, where M. Jourdan translates Reil and Gall, instead of which M. Tiédemann says, Gall and Reil. The first, (who is myself, according to Tiédemann, and who, quoting from Jourdan, is Reil,) gives to the corpora striata the name of great superior cerebral ganglions, and the other calls them, great external cerebral ganglions, as Reil has shown us in his demonstrations at Halle. Such gross mistakes of a translator induce the belief, either that he

---

\* Tiédemann, l. c., p. 130. Anatomie und Bildungs-geschichte des Gehirns im fœtus des Menschen.

is a stranger to his subject, or that he designedly errs.

It is not my intention to rectify all the errors of the work of M. Tiédemann, in other respects a very important one, nor all the faults of the translation of M. Jourdan. It will be sufficient to maintain the three principal points, in regard to which M. Tiédemann and myself are at issue. The first, that the white fibrous substance does not arise from the pulpy non-fibrous substance: the second, that there are not two different nervous systems, one converging, the other, diverging: the third, that the unfolding of the convolutions of the hemispheres does not take place.

*Is the Doctrine tenable, that the white Fibrous Substance of the Nervous System arises from the Pulpy Gelatinous and Non-Fibrous Substance?*

Let us begin with the medulla spinalis. M. Tiédemann says, p. 128: "It is easily ascertained at an early period, in the second, third, and even in the fourth months, that the canal of the medulla spinalis has, in proportion to the thickness of the coats of the medulla, much greater size than afterwards. The contraction which takes place, by the increased development of the embryo, is caused by the deposition of a new substance, formed by the pia mater, the materials of which are derived from the blood sent from the heart, and which, increasing the size of the coats of the cylinder, must necessarily diminish the calibre of the central canal. This substance is soft, reddish, and filled with numerous minute vessels, in the course of the two last months. It cannot be doubted, from the above, that the cortical substance of the medulla spinalis has an origin posterior to that of the fibrous medullary substance, and that it is placed from within outwards, on the surface of the latter. Therefore, Gall's opinion is erroneous as respects the medulla

spinalis, who pretends, that this same cortical substance is formed anterior to, and is the matrix of, the medullary; for, the roots of the spinal nerves are already perceptible in the second and third months, although, at this period, the cortical substance has not been deposited in the canal of the medulla spinalis."

This is the conclusion adopted by M. Tiédemann, in accordance with several German anatomists. Before I offer proofs in support of my proposition, let us quote again from M. Tiédemann, and it will be found that his own observations are in opposition to his notions.

"During the first month, and at the commencement of the second, he observes, p. 125, the medullary spinalis has the form of a membranous canal, which *contains a liquid and transparent fluid*. Towards the end of the second month, this fluid is converted into a *soft and pultaceous mass*, like the white of the egg. As the tissue of the medulla acquires consistence, its transparency diminishes. If the fœtus is put in alcohol, the soft and fluid substance of the medulla spinalis coagulates and becomes firmer. At the end of the second month, and at the commencement of the third, *fibres cannot as yet be seen, even by the aid of alcohol; and, on examination of the medulla with the microscope, it appears to be composed of minute globules*. The small globules, which are disposed parallel to each other, and take a longitudinal direction, cannot be seen before the beginning of the fourth month on the anterior surface. These fibres gradually increase in number, not only anteriorly, but also on the sides of the two principal cords of the medulla spinalis. During the whole of the first month, and at the commencement of the second, the medulla spinalis has the form of a membranous canal containing a limpid and transparent fluid. The coats of this canal, which enclose this fluid, are not composed of medullary substance, but are formed by the dura mater, which, at this period, is thin and with-

out any appearance of fibres, and by the pia-mater abounding with blood vessels."

I ask M. Tiédemann how he can infer from these data, that the pulpy, non-fibrous substance, is posterior to the white fibrous substance? If he would examine without prejudice, he would find, as he states most distinctly, that the pia-mater with its numerous vessels, and a liquid substance, successively glairy, pulpy, gelatinous, and reddish, exists a long time, before any trace of fibrous matter is perceptible. Truly, a light breaks upon us, when, after reading the premises, we arrive at the unexpected conclusion, that the cortical substance of the medulla spinalis has an origin, posterior to that of the medullary fibrous substance! Or does M. Tiédemann wish to take advantage of the expression *cortical*, as if I had maintained, that it is a substance, placed on the external surface of the medulla spinalis, which gives origin to the other? But, is he not aware, that we have always very distinctly stated, that it is the pulpy, gelatinous substance, the non-fibrous, abounding in blood vessels, the first secreted by the pia-mater, which is the source of the nervous filaments, which nourishes and multiplies them, and which consequently may justly be called the *matrix*, the nourishing substance of the nervous filaments? Whether placed externally or internally, it is always the apparatus of origin and reinforcement; its function is at all times the same.

Let us follow M. Tiédemann, and it will be seen, that his prejudices always lead him to some false conclusion.

"The anatomy of the fœtus is no way favorable to the hypothesis of M. Gall, according to which the medulla spinalis of man and the superior animals would be composed of ganglions or enlargements of the grey substance, distinct, but adherent to each other, and as many in number as the pairs of nerves which it furnishes. If the ganglions were a part of this medulla, which is first formed, and if the medulla



itself resulted from their union, it would be the case, that, in the embryo they would be distinctly visible, as in it the medulla spinalis is found in the lowest state of organization. But, on examining it from its first period, nothing can be discovered like enlargements or ganglions." p. 134.

It is because, from the commencement, the medulla spinalis is found but little developed, and because the period for the appearance of the nerves has not yet arrived, that these enlargements cannot be distinctly perceived. How can they be seen in a medulla, which as yet has no consistence, which cannot as yet be separated from its sheath? Have not anatomists, and even the committee of the Institute themselves, denied the existence of these enlargements, so distinct and so evident, the medulla spinalis of man, of the ox? But let us proceed :

"But Gall is right in saying," remarks M. Tiédemann, "that in the adult, the parts of the medulla, the most amply supplied with cortical substance, are those whence the largest nerves take their origin."

Well! if the largest nerves must have a more abundant supply of a cortical substance, does it therefore follow that the lesser need have none? Does not that prove, that the non-fibrous substance will be so much the less perceptible, as the nerves to which it gives origin are the more delicate; but that without it there can be no fibrous substance?

"It may be seen at an early period," continues M. Tiédemann, "that the medulla spinalis of the fœtus is larger in those points, whence the great rachidian trunks arise, which form the nerves of the upper and lower extremities: its canal also is more dilated in the same place, during the last months, when the coats of the medulla are strengthened by the formation of new medullary fibres, and when the canal is diminished, and then filled up gradually by the cortical substance there deposited, it is in these places that most of this grey substance is found abounding in numerous blood

vessels, which give it a reddish appearance. But it is also true, that this considerable mass of cortical substance belongs to a secondary formation, and is no part of the original state."

Certainly these considerable masses of non-fibrous matter belong to a secondary formation, since the nervous filaments, which they produce at a later period, do not exist at first. It is thus, also, that many other ganglions, with their nervous system, are secreted afterwards, as the olivary ganglions, the corpora geniculata, the pineal ganglion, &c. &c., and their nervous bundles; it is thus, also, that all the ganglions increase in gelatinous matter, in proportion as they have their nervous productions to reinforce, as the corpus ciliare, or the central point of the grey matter in the interior of the hemispheres of the cerebellum. But the addition of the fibrous substance is always preceded by an increase of the non-fibrous. This is strictly conformable to the laws of the vegetation of plants. Pull up a tree in November, December, or January, and you will find that, while the vegetation of the branches was wholly suspended, the growth of the roots was vigorous. You will find a large number of white thick filaments, which are distended by the mucilaginous matter: subsequently, these large filaments are changed into others much more delicate. It is the same with the buds; before they are extended into branches, they are enlarged by the accumulation of the mucilaginous matter of the *cambium*.

"The presence of a great quantity of grey substance in these places of the medulla spinalis, where the large nervous trunks come out, which is so filled with vessels that Ruysch believed it wholly vascular, contributes entirely, during life, to increase and exalt the nervous action according to the general law, that the force and energy of an organ is in proportion to the degree of arterial blood, distributed to it. M. Gall is in error, in affirming that the grey substance, to which

he gives the name of matrix of the nerves, is the first formed, and is that, which produces and nourishes the nerves. But I agree with him, that it strengthens and fortifies the action of the parts of the brain and nerves, which arise from it, but only as this effect is produced by the arterial blood which circulates in it, and by the greater rapidity with which it repairs the loss, induced by the exercise of the vital action. I admit then an intimate relation between the size of the spinal nerves, and the enlargements which are seen in those places, where these nerves originate. This is easily proved in fishes, where the origins of the nerves always produce particular ganglions, [it would be better to say, where particular ganglions give origin to the nerves,] whenever these nerves, and the organ to which they are distributed, are greatly developed, or when there are particular organs, which are wanting in other fishes."

After the foregoing, M. Tiédemann enumerates several species of fishes, where the nerves always originate from the ganglionic substance, and infers from it, that no one can doubt, that the local increase of the mass of the medulla spinalis, by the addition of more or less of this substance, is for the purpose of exalting the action or activity of the nerves, which arise from these ganglions, and which would be superfluous, if the sanguineous vessels could effect the same result by their great number only.

I have delineated in my large work the nervous system of voluntary motion of the caterpillar, where all the ganglions form a kind of chaplet, which shows these enlargements so distinct and connected by a double nervous cord, that their existence is evident at every point, where the nerves originate. In serpents and in all animals, whose medulla is prolonged, these distances are very clearly marked. It is the same in birds, as is seen in the medulla spinalis of the hen, which is also engraved in my work. Examine it in the marten and the hare, even after these animals have

been cooked, and you will readily perceive throughout its whole length, the enlargement very distinct at each origin of a nerve, without taking into view those longer ones, whence proceed the nerves of the extremities. The same occurs in all animals and in man, but not in so evident a manner, since the distance from one enlargement to another, is less. To be convinced of this, draw out the medulla from its membranes, keep it in water, and not stretch it upon a board, as we have seen it done. The enlargements are always found at the union of two vertebræ, as the parts where they are in contact, are wider than the canal of the bodies of the vertebræ. As to the increase of the vital power by ganglions, I admit it, but only inasmuch as a larger nerve, *cæteris paribus*, exercises a more energetic action than a smaller one, and because all excitement stimulates the action of an organ. Reil thinks that the ganglions have the functions of modifying impressions made upon nerves. It is in this way mankind reason and rave, when they attempt to explain those matters, which are beyond our capacity.

Let it be borne in mind, that it is not the fibrous, but the gelatinous, non-fibrous substance, that is penetrated by an abundant tissue of blood vessels; that the whole formation of every organ is necessarily effected by the vascular system: is it not then conformable to physiological principles, to seek the primary origin of the nervous filaments in a substance directly secreted and thoroughly penetrated by an infinity of blood vessels? When one is forced to assert, that, wherever ganglions exist, filaments come from them; that, wherever a nerve is united to a ganglion, it goes from it increased in energy; that all the nerves are more or less accompanied by this same substance, and by it that they acquire a successive increase so as to become conical: it is difficult to understand, how one can fail to distinguish in the non-fibrous substance, the primary and sole origin of the



nervous filaments. Let the evidence in this matter be properly weighed, and the position would no longer be maintained, that, in the second month, no nerve can be distinguished, coming either from the medulla or the brain: that, even in a fœtus of seven or eight months, no fibrous structure can be seen in the two cords of the medulla spinalis, not even by a powerful magnifying glass, nor when hardened in alcohol: and, that the roots of the spinal nerves may be perceived in the second and third months, which may be very possible, although M. Tiédemann could demonstrate only that the fluid substance, which had become successively gelatinous and deposited in the canal of the medulla spinalis, is not the same substance, which I describe, as generating and nourishing the nerves; and after having denied in many places the existence of enlargements throughout the length of the medulla spinalis, one would not be compelled by the force of facts to avow, that the soft and reddish substance, into which enter numerous vascular ramifications, is, at the ninth month, more abundant *on all the points where the nerves arise from the lateral part of the medulla*, and still more abundant at the origin of the large nerves of the extremities.

In addition to all these proofs, it may be remarked, that, in the most inferior animals, the nervous ring, which surrounds the œsophagus, is provided with a mass of non-fibrous substance, which gives origin to the fibrous matter, which terminates by forming the ring and the extreme ramifications or rays: that the medulla oblongata is but the continuation of the spinal nervous cords, increased by as many ganglions as there are pairs of nerves going out, and that these same ganglions, which form a single large expansion in the superior animals, exist more or less numerous, and more or less separate and distinct, &c., in the inferior.

Hitherto I have demonstrated, that in the whole length of the medulla spinalis the nervous fibrils, whether the cords themselves or the nerves, originate

from a mass of non-fibrous cerebral substance, and that the opposition of M. Tiédemann and his partisans is so much the more gratuitous, as they themselves teach, that, in the first month, there is no sensible difference between the two fibrous and non-fibrous substances of the medulla spinalis, and that, consequently, nothing can be affirmed as to the non-existence of the non-fibrous substance. We shall refute M. Tiédemann by his own words, as to the cerebellum and cerebrum.

Page 119, he says: "I have repeatedly dissected fresh brains, either of fœtuses of six, seven, eight, and nine months, or of new-born infants, in order to acquire a just idea of the relation, which might exist between the different cerebral substances in the different portions of the encephalic organ. The uniform result has been, *that it is impossible to establish* any distinction between the cortical and the medullary substance, in the brain of the fœtus. All the constituent parts are formed of an homogeneous and white reddish substance. This redness is evidently owing to the great number of minute blood vessels which are distributed to the cerebral substance. In all parts, where we have found the grey matter in considerable masses in the adult, as in the cerebral peduncles, where it takes the name of corpus nigrum, corpora striata, optic thalami, &c., I have discovered that the vessels were larger and more abundant, than in those, which are composed of medullary substance after the period of birth. Therefore, the names given by anatomists to certain parts of the brain, are not appropriate, when they are examined in the fœtus; for example, the terms corpora striata or canniculata. In fact, the parts, which correspond to these eminences in the cerebrum of the fœtus, are not striated, but composed of an homogeneous white mass, with a reddish tinge, and penetrated by a multitude of vessels of large size. There is, moreover, no difference as regards color, between the cortical and medullary

substance, either in the convolutions of the cerebrum or in the layers of the cerebellum. The exterior layer, which corresponds to the cortical substance, is of a reddish white, like the interior layer corresponding to the medullary. The only sensible difference, which appears between these two substances in the fœtus, which are so easily distinguished from each other in the adult, is, that the exterior layer like the bark in its nature is softer, and perhaps somewhat more abundant in vessels than the interior portion."

By this extract it appears, that the non-fibrous substance much exceeds the white fibrous substance, during the period when the brain is not wholly formed; it is therefore necessarily the primary, and it is from this that fibrous substance takes its rise. M. Tiédemann often asserts with emphasis, that always the fibrous substance is increased by the non-fibrous. As we were the first to demonstrate this fact, how could he so far have committed himself as to assert, that the white fibrous matter is anterior to the reddish, grey or non-fibrous? In the corpora ciliaria of the hemispheres of the cerebellum, in the first great ganglions of the brain, or the annular protuberance, in the crura cerebri, in the optic thalami, in the corpora striata, &c., the white fibrous substance increases in proportion as the non-fibrous accumulates in these parts. Many masses of gelatinous non-fibrous substance evidently exist before the nervous fibrils, which afterwards originate from them, as the corpora genicula, the bulbs of the olfactory nerves, &c. Does not all this show in a decisive manner, that, at every period and throughout, the gelatinous substance fills the interior or the exterior surface of the hemispheres, gives rise to the nervous fibrils, or, in other words, that it is the matrix, the nourishing substance of the white fibrous matter of the whole nervous system?

Add to this, all that we have said in my large work, vol. i. p. 37 and 47, when treating of the nervous system of the vertebral column, and every doubt of

the use of the non-fibrous substance will be entirely dissipated.

*Is it true that, both in the Cerebellum and Cerebrum, there is a Diverging and a Converging System?*

All modern anatomists are of opinion, that the corpora restiformia, or the peduncles of the cerebellum, enter into the hemispheres of the cerebellum, that they there meet a new ganglion, the corpus ciliare, where their nervous mass is reinforced, and whence it spreads into branches and minute ramifications. It is at present admitted, that the pyramids are reinforced in their passage through the annular protuberance, whence they proceed, taking the form of the great peduncles of the hemispheres of the cerebrum. These peduncles, being enlarged by the non-fibrous substance enclosed in their interior, continue to advance, and terminate in a great ganglion, or mass of non-fibrous substance, the optic thalami; there they are increased by the addition of the fibrous matter, a great part of which is distributed in a radiated manner towards the hemispheres, and the remainder to a third great mass of non-fibrous substance, the corpora striata; it there also receives a great increase of the fibrous matter. This fibrous substance there forms great nervous bundles, which, radiating similar to those of the second great cerebral ganglion, like a fan, towards the periphery of the hemispheres, is there spread out into a nervous membrane. This does not exist in a state of health as an extended membrane, but in folds, like a furlow, and thus showing the internal half of the convolutions and anfractuositities.

Such is the diverging nervous system of the cerebellum and cerebrum. All anatomists, who follow the progress of the science, have adopted this exposition of the structure, since our public demonstrations and the publication of our anatomy of the brain.



With the exception of the mechanical explanation of the formation of the convolutions and anfractuosities, which I have already refuted, MM. Carus and Tiédemann profess the same theory. Therefore, it is not necessary for me to defend the diverging system against the anatomists.

But those, who have not seen the unfolding of the hemispheres of the cerebellum and cerebrum; those, who have not observed the different direction of the nervous fibres of both the cerebellum and cerebrum, obstinately reject the idea of a converging nervous system of these parts.

It is, therefore, this important part of the anatomy of the nervous system, that I shall once more endeavour to demonstrate.

### *Converging System of the Cerebellum.*

It is certain that the nervous filaments always originate from the non-fibrous substance. Now, the whole surface of the lamellæ, branches, ramifications, and layers of the cerebellum, is covered by the same; this consideration itself should dispose anatomists, who are convinced of the stability of the laws of nature, to seek, in this non-fibrous and cortical substance, the origin of another order of nervous filaments, besides those which diverge in that direction, from the ciliary ganglion of the hemispheres of the cerebellum.

This probability is rendered certain, when it is found, that the fibrous substance of the hemispheres of the cerebellum, and of the annular protuberance, is too abundant to be furnished by its primary bundles and its ciliary bodies. This increase, then, must come from another source, that is, from the non-fibrous substance situated on the surface of the cerebellum.

In fact, when the direction of the primary bundles is examined, from the peduncles of the cerebellum, after having scraped the ganglion of the auditory

nerve, on the external edges of the fourth ventricle, it will be perceived, that they dip down into the interior of the hemispheres. It is entirely different as to the direction of the transverse nervous bundles of the annular protuberance. If the small lamellæ of the external border of the hemispheres of the cerebellum are separated, without tearing away any part with the finger, following always the direction of those large and broad bundles, and upon these same bundles, it will conduct us even to the extremities of the ramifications and the layers. Sometimes, even by this simple process, the whole cerebellum may be unfolded, in the same manner as is done in a dropsical state. It is, then, evident, that all the nervous filaments, which form the annular protuberance, are only the continuation of the primary bundles, but originating from the extremities of the lamellæ and ramifications, converging and uniting themselves to the same filaments of the opposite side, forming the reunion, junction, or commissure of the cerebellum. I refer the reader, who wishes for more detailed and scientific views on this subject, to my large work, vol. I. p. 258, in 4to.

Let us now hear M. Tiédemann: "The annular protuberance," he says, page 167, "composed of transverse fibres, originates from the middle or lateral cords, which surround the olivary and pyramidal bundles of the medulla spinalis, below which they unite together on the median line. These middle cords come from the corpora rhomboidea and the white substance of the cerebellum; so that they appear as soon as the medullary nuclei begin to form, that is, at the fourth month. M. Gall pretends, that they are produced by the particular fibres, to which he gives the name of reëntering (*rentrantes*) fibres, which, according to him, originate from the grey substance spread upon the laminæ, and especially upon the cerebellum, which, by uniting, form the great commissure or the pons Varolii. These entering fibres are imaginary things;

for, the annular protuberance and medullary fibres composing it, already exist in the fœtus of four months, that is, at a period when there are neither branches nor ramifications, nor even laminæ, which are covered with the cortical substance. M. Gall makes them arise from parts which are formed after them." Page 93, he remarks: "Other fibres also he derives from the corpus ciliare, which are spread without and in front, surrounding the olivary and pyramidal bundles of the medulla spinalis, and uniting together to form the annular protuberance."

If the transverse bundles of the commissure of the cerebellum are continuations of a part of the primary bundles of the cerebellum, why is it that these transverse bundles do not appear simultaneously with the first rudiments of the hemispheres? Why do they appear only at the fourth month, when the hemispheres of the cerebellum have already acquired a considerable development, that is, when the hemispheres are sufficiently developed to supply the new white fibrous substance? The direction of these new filaments is opposite to that of the filaments, which are the continuations of the primary bundles. Moreover, the latter diverge in their course, while the others, coming from the surface, constantly approximate, to form the commissure. When M. Tiédemann could deduce an argument against my assertion from the fact, that, until the fourth month, the lamellæ and layers of the cerebellum are not perceptible, I again answer him, that it is neither from the lamellæ, nor layers, &c., that I refer the nervous filaments, but from the non-fibrous substance. Now, I have already shown, how, M. Tiédemann is mistaken in asserting, that the non-fibrous substance is formed at a later period than the fibrous, and that the cortical is the last. He does not suppose, then, that the surface of the hemispheres of the cerebellum and cerebrum, is enveloped with the innumerable vessels of the pia-mater; and that these same vessels first secrete the gelatinous substance,

non-fibrous and here termed the *cortical substance*! He forgets what he so often repeats, that there is no difference between the cortical and the medullary substance, either in the convolutions of the cerebrum, or in the laminæ of the cerebellum, and that the exterior layer, which corresponds to the cortical substance, is of a reddish white, similar to the interior layer, which corresponds to the medullary.

It is evident from this discussion, that M. Tiédemann did not see correctly, when he thought he perceived, p. 114, that a middle peduncle came from each corpus ciliare, the transverse fibres of which surrounded the olivary and pyramidal bundles, and formed the annular protuberance, by their union with those of the opposite side. Let us now see, if he is more successful in his views of the great commissure of the hemispheres of the cerebrum.

*Corpus Callosum, great Commissure of the Hemispheres of the Cerebrum.*

The evidence, which I have just brought forward to prove the converging nervous system of the cerebellum, is also applicable to the cerebrum. It is equally to be presumed, that the non-fibrous substance on the surface of the hemispheres gives origin to other nervous filaments, as those which were expanded towards this same surface, after being reinforced by the great cerebral ganglions.

It is also certain, that the nervous bundles, which radiate from the two great cerebral ganglions or optic thalami and corpora striata, do not wholly supply all the white and fibrous mass of the hemispheres. This increase of the fibrous substance, this enlargement of the hemispheres must be derived from another source. And whence must it be derived, if not from the cortical substance of the hemispheres?

The following is the explanation of this increase or



augmentation of the hemispheres, according to M. Tiédemann. "The membranous hemispheres successively cover, in the fœtus, the corpora striata, optic thalami, tubercula quadrigemina, and lastly, the cerebellum as they are thus prolonged from before backwards; their volume increases by new layers of cerebral substance, which is secreted by the blood furnished by the vessels of the pia-mater. The radiating fibres, which constitute the base, increase in their turn in these depots, *and others are applied to their surface*, which, instead of inclining inwards, on the contrary go outward, and tend towards the circumference." Page 258.

I doubt very much, if any anatomist comprehends or adopts this hypothesis. Thus M. Jourdan was much puzzled to convey the meaning of M. Tiédemann. He thus expresses himself: *Die in die Hemisphären sich fächerförmig ausbreitenden Fasern der Hirnschenkel bilden sich in jene neue abgesetzte Masse fort, und es legen sich neue in die Peripherie sich ausbreitende Fasern an jene von aussen nach innen gekrümmte Fasern an.* Is it not evident, that M. Tiédemann has here imagined things, which he could not see? And who will agree with him, that there are nervous fibres, which are not derived either from the optic thalami and corpora striata, or from the cortical substance of the hemispheres?

However the two orders of fibres do not pass unnoticed by him. He says, p. 86: "There is then a double radiation of fibres in each hemisphere. Some radiate directly from within outwards, while those of the internal surface have a direction, on the contrary, from above downwards."

It is probably this phenomenon, the explanation of which has been so difficult for him to adduce.

Before continuing my proofs, that the great commissure of the hemispheres of the cerebrum is formed by the fibres, which originate in the cortical substance, and which, by converging, unite the similar fibres of

the hemispheres, I will give the opinion of M. Tiédemann. "My works," he says, page 259, "confirm the results, which M. Gall has arrived at from his researches upon the course of the cerebral peduncles, through the optic thalami and corpora striata, as far as into the hemispheres and convolutions; but they refute all that this anatomist has said of his pretended system of reëntering fibres."

And also p. 264. "It is seen, that the corpus callosum is produced by the reunion of the fibres of the two cerebral peduncles, and after that they have expanded to form the hemispheres. The reëntering fibres, by which M. Gall has explained its formation, and that of the anterior commissure, are therefore things which have no existence. This anatomist pretends that the reëntering medullary fibres arise from the grey substance of the convolutions; that, in descending, they cross the ascending and radiating fibres of the cerebral peduncles, and that they afterwards converge towards the median line, where they unite to form the corpus callosum. But all these assertions are but mere hypotheses; for, the corpus callosum already exists in the fœtus of four or five months, that is, at a period when there are neither convolutions, nor layers of cortical substance, on the surface of the cerebrum. The pretended reëntering fibres therefore cannot have an origin from parts, which have no existence. But a positive proof of the incorrect views of M. Gall in this respect is furnished, by the uninterrupted connexion, which I have observed, between the medullary fibres of the peduncles and those of the corpus callosum."

M. Tiédemann, as we have seen, is forced to admit a double radiation of fibres; we have also observed this double direction of fibres, but could never discover, that the radiating fibres were reflected without interruption in their descent, and I challenge any one to show this fact; he, who proves too much, proves nothing. As we were convinced, that the non-fibrous

substance at all times throughout gives origin to the cerebral fibres, we have preferred to adopt the opinion, that this second order of descending fibres takes its origin in the non-fibrous substance, which, at every period, covers the surface of the hemispheres. Here, again, M. Tiédemann insists upon the convolutions, the existence of which he has not yet acknowledged. Here, also, I must again repeat, that I do not make the nervous filaments originate from the convolutions, but from the non-fibrous substance. Now, M. Tiédemann himself asserts, that before birth no difference is perceptible between the two substances ; he even affirms, in several places, the existence of the pulpy non-fibrous substance on the surface of the hemispheres, p. 120. How then can he pretend, that the cortical substance is not formed until after birth ? The corpora striata, also, do not appear until a later period, as composed of two substances perfectly distinct. Can he maintain that, in the first months, the non-fibrous substance has no existence in this great cerebral ganglion ?

M. Tiédemann censures Reil, who, after my example, considers the transverse bundles of the great commissure, as aggregations of particular fibres, and wholly different from those of the cerebral peduncles. Reil saw our demonstration of the brain, and was convinced of the truth of this phenomenon. And I think that, if M. Tiédemann should witness one of our dissections, or rather one of our developments of the brain, he would soon become a believer in the two nervous systems, the diverging and the converging. In the mean time, I invite him to reflect on the following considerations, and to pursue our manner of dissecting the adult brain.

If the transverse fibres of the great commissure are continuations of the radiating fibres of the corpora striata, how could he explain why the commissure was not formed, as soon as the radiating fibres of the corpora striata and optic thalami were sufficiently extended to meet the median line ?

Why does this commissure appear after the hemispheres have already acquired a considerable development, at the end of the third month? p. 262.

Why is it that the great commissure is formed from before backward, p. 264, while all the successive formations of the corpora restiformia and the peduncles of the cerebrum succeed each other from behind forwards? According to my views, the reason is evident: it is, that the transverse fibres of the great commissure are not continuations of the radiating fibres of the peduncles, but of fibres originating posteriorly, and coming from an opposite direction, arising simultaneously from the surface of the anterior lobes, which are the first, that acquire a considerable development.

Lastly, let us take an attentive view of the great commissure itself, and compare the direction of its fibres with that of the radiating fibres of the corpora striata.

After having scraped, either with the finger or with the rounded handle of a scalpel, the non-fibrous substance of the corpora striata in the lateral halves of the hemispheres, nervous bundles only are seen, more or less large, taking a direction forwards, inwards, and backwards, precisely like a fan, that is, diverging from the optic thalami and corpora striata towards the surface of the hemispheres.

Let us undertake to expose the external portion of this great mass of non-fibrous substance, which is done by pushing it gently with the end of the finger towards the anterior part of the corpora striata, and following it in its direction externally and from before backwards (an operation which unfolds a convolution, which surrounds this part of the corpora striata, and which is in contact without adhering to them): scrape in the same way this non-fibrous mass, raise the peduncles, and you see the large bands of the nervous bundles radiating in every direction, forwards towards the anterior, laterally towards the middle, and posteriorly towards the posterior lobes.



In this position, you have the internal surface of the great commissure in full view. This commissure being equally composed of nervous fibres, their direction is not difficult to discover. First, make a slight longitudinal incision in the middle of its length, and with the blade of a scalpel placed perpendicularly, separate the white mass, and you will perceive the transverse direction of all the fibres, which form the largest portion of the commissure. This direction might lead to the supposition, that these are the immediate continuations of the nervous bundles of the corpora striata, those in the centre, appearing to take a direction towards the median line: but the error is soon perceptible, when it is considered, that the bundles, proceeding from the corpora striata, are much larger than those of the commissure.

But how can it be comprehended, that the bundles, which take a direction inwards or towards the commissure, are not extended immediately into the commissure? Pass the fingers of the right hand between those of the left: it is in this same way, that the bundles of the corpora striata penetrate between the converging bundles, which come from between the diverging bundles, and go to form the transverse portion of the commissure, while the diverging are expanded more and more, to form the cerebral membrane and convolutions.

Now scrape the fibres of the commissure at the anterior and posterior extremities, and you will perceive another direction: you will find that, at the anterior extremity, the fibres, which go to the commissure come converging, from the anterior lobes, and that they cross the diverging fibres of the corpora striata, in a slanting direction. At the posterior extremity, the fibres, or rather the large nervous bundles, converge from the posterior lobes, cornu Ammonis, &c., taking a direction from behind forwards, and likewise crossing, in a slanting manner, the nervous bundles of the corpora striata, which diverging pass

from before backwards, consequently in an opposite direction to the diverging bundles; it is therefore impossible, that the former should be the direct continuations of the latter.

There is another circumstance, which evidently shows, that the converging bundles reënter the hemispheres, which M. Tiédemann has omitted to mention, because he could not explain it satisfactorily by his hypothesis. It is known, that the great commissure forms a fold anteriorly and posteriorly: and that, in these folds, the converging direction towards the commissure is very evident, principally from right to left. It remains for us to explain, how these folds are formed, &c. This explanation at the same time will give an idea of the disposition of the cerebral membrane, such as it exists in its natural state.

Take a half sheet of paper, a foot long and seven inches wide. Mark it with lines near each other, in the direction of its length from left to right, to imitate in some degree the white fibrils of the cerebral membrane. This white and ruled surface represents the cerebral membrane unfolded. There is no separation of the two halves, no opening, either anteriorly or posteriorly. The nervous fibrils, or the lines which unite the two halves (the great commissure) are extended horizontally through the whole width of the sheet. This should be the case of the two hemispheres of the brain, if they existed in an unfolded state.

In order to understand, how nature has formed the anterior and posterior slopes of the hemispheres, or their four prolonged angles, and the anterior and posterior folds of the great commissure, it may be imitated in the following way:

Fold the anterior and the posterior middle about an inch wide, but so that the four corners of the sheet remain spread out. Thus the paper will be doubled one inch in width in the two anterior and posterior middle parts, and there will be in the middle of the sheet

still three inches not folded. Therefore, there will be an interruption of the width of the great commissure, by its two anterior and posterior folds.

Then fold the two extremities of the right and left two or three inches wide, towards the median line, and this will give the slope formed by the four angles or wings of the hemisphere, and the middle folds. You will conceive how the ventricles or cavities of each hemisphere are formed ; the oblong square three inches in length not folded, which remains in the middle, will represent the great commissure.

On examining the direction of the lines in the two folds, the fibrils of the cerebral membrane, you will see, that their horizontal direction, which is preserved in the length of the commissure, is changed. The lines take a direction from the four angles, returning obliquely from right to left, and from left to right, towards the median line.

After all this, place the circle radiating from the corpora striata, at the distance nearly of one inch and an half from the great commissure in the cavities, and you will be convinced that the lines, their bundles radiating like a fan, cross each other anteriorly and posteriorly, with the lines or entering nervous bundles of the folds ; that, therefore, some of these bundles are not continuations of the others ; and lastly, that the white fibrous substance of the hemispheres is composed of two layers, one of which is formed by the expansion of the bundles of the great ganglions, the optic thalami and corpora striata ; the other, by the reëntering fibrils of the non-fibrous substance of the surface of these convolutions.

### *Anterior Commissure.*

Page 230, M. Tiédemann says : “ M. Gall regards the anterior commissure, as belonging to a system of organs composed of converging fibres, which he sup-

poses to originate from the grey substance of the cerebral convolutions. These reëntering fibres, or apparatus of reunion, are imaginary things. M. Gall says, that the anterior commissure is produced by fibres reëntering, which arise from the anterior convolutions of the middle lobes, and from some of those which are near the fossæ Sylvii, and that these fibres take a course from without inwards, so as by their reunion to produce the anterior commissure. The following facts prove, that he is also mistaken in this respect. The anterior commissure already exists in the brain of the fœtus of three and four months, consequently at a period when the brain has no convolutions; for, these do not appear until some time afterwards. It cannot therefore arise from the converging fibres of parts, which have no existence."

Can it be necessary again to prove the futility of an argument, deduced from the non-existence of the convolutions of the middle lobes? But the anterior commissure does not yet exist at the second month; M. Tiédemann has not observed it before the third; at first, it is very thin and delicate; but it increases gradually, in the ratio of the development of the hemispheres. Why does it not exist as soon as the radiating fibres of the corpora striata? It only appears at the period when the middle lobes are partly formed, and consequently covered by the pia-mater and the gelatinous, pulpy, non-fibrous substance.

"This is the manner," says Tiédemann, p. 229, "in which the anterior commissure originates: the cerebral peduncles, after having penetrated the corpora canniculata, expand their numerous medullary fibres into the hemispheres, many of which incline from behind forward, and from without inwards, connecting themselves in the form of a cord, and forming a union with those of the opposite side. The anterior commissure then is a medium of union, between the radiations of the two cerebral peduncles, the corpora canniculata, and the two middle lobes of the hemi-



spheres of the brain. M. Chaussier well understands the origin; as he makes the fibres, which form it, to come from the cerebral peduncles."

It would be interesting to know the means, which M. Tiédemann employed to discover the radiating fibres of the peduncles, expanded in the hemispheres, and inclined from behind forwards, and from without inwards, &c.; but let us refer to autopsy; this alone will refute all the ideas, which are in contradiction with nature and common observation.

After placing the brain on its convex part, turn up or remove the optic nerves, and you will perceive a white, nervous cord, of the size of a crow-quill. Scrape with the handle of a scalpel, or with the rounded blade, this non-fibrous substance, but without including the nervous cord or the anterior commissure itself. Follow the direction of the cord which goes, slightly curved in its course, from before backwards and towards the anterior part of the fossæ Sylvii. Then with the same precaution, raise the non-fibrous substance, until the whole surface of this cord is exposed. Having reached the anterior extremity of the middle lobes, you will see, that this cord begins to be divided into many minute cords, which penetrate into the fibrous substance, diverging, and, as the cerebral substance is but the cerebral membrane folded into convolutions, consequently into the convolutions of the middle lobes. It is therefore evident, that medullary fibres come from the convolutions of the middle lobes, which, approximating successively, form little cords, which, by converging and uniting, constitute the great cord, which therefore is the reunion, the junction, the commissure, of a part of the middle lobes. Through its whole course, this cord has no connexion with any other part, neither with the corpora striata, nor with the peduncles of the brain. To make this certain, cut it in the median line, and remove it carefully with the handle of a scalpel. Do this without tearing it, as far as its entrance into the middle lobes. In its

course, you will meet some nervous bundles, that you might suppose were connected with this cord, but, with greater attention, you will see that these bundles pass above, or, in this position, below, and that they come from the corpora striata. The cord being thus raised through its whole extent, leaves a groove in the non-fibrous substance of the corpora striata, which groove is perfectly smooth; which proves that there was no attachment, and that, consequently, it had no connexion either with the peduncles, or with the corpora striata.

### *Unfolding of the Hemispheres of the Brain.*

The unfolding of the hemispheres of the brain will always be an insurmountable difficulty, a stumbling block to every anatomist, who has never seen this operation. In fact, this unfolding would be impossible, if the ideas of M. Tiédemann, respecting the structure and formation of the hemispheres, were correct.

The following is the manner M. Tiédemann explains the increase and structure of the hemispheres; p. 86, he says: "The vessels of the pia-mater, which envelope the cerebral substance, and which, no one will deny, are the organs that form and nourish this substance, separate from the blood which they carry to the encephalon, by means of ramifications detached from the internal surface of the membrane, the new cerebral pulp or mass from which it originates. This pulp then is arranged *in layers from within outwards*; it *crystalizes*, if I may use the expression, *under the form of fibres, which connect themselves to the surface of the primary fibres*. The walls of the hemispheres acquire greater thickness by the increase of the pia-mater, and by the successive depositions of new layers upon the old. An examination of the cerebral substance furnishes proofs in support of the opinion I

have advanced. When the pia-mater is detached from the encephalon, *layers, more or less thick, of the cerebral pulp*, remain adherent to its internal surface, which is evidently in consequence of the soft exterior substance, which is the last deposited, adhering still to the vessels belonging to the internal surface of the membrane. The layer which is adherent to the parts of the pia-mater, which have been detached, and the superior layer of the brain, deprived of this envelope, are both equally soft, and exhibit no fibrous appearance. Examined with a microscope, they appear to be composed of very minute globules. If the brain is torn, fibres are seen, on which is a layer of soft substance, and without a fibrous texture. This substance, *which is secreted the last, has not as yet been sufficiently matured to take the form of fibres*. Perhaps it may be said, that it corresponds to the cortical substance; but this objection has no force, for the cortical substance is not deposited on the surface of the brain until after birth."

The reader must be surprised at the efforts made by M. Tiédemann, to sustain his prejudice against the origin of the nervous filaments of the non-fibrous and cortical substance. It is hardly possible to make concessions more explicit in favor of my proposition. At all periods of life, this soft and non-fibrous substance adheres to the pia-mater; how can he know, then, that it has been the last to be secreted? To crystalize, not to have had time to take the form of fibres, &c., truly are dreams unworthy of such an anatomist as M. Tiédemann! There is no doubt, that the substance, which is soft and without fibrous texture, corresponds to the cortical, and, if it does not appear as a substance different from the fibrous substance, until after birth, it is because that, in general, both externally and internally, the two substances become more distinct, in proportion as the soft substance diminishes, after it has given origin to the white fibrous substance, and confined itself to the limits prescribed by the various periods of life.

All, who have seen the hemispheres unfolded, know that the cerebral membrane is, throughout its whole extent, of nearly the same thickness; that the external layer of the cortical substance equals in thickness the internal substance of the fibrous matter: how can this fact be reconciled with the idea, that the hemispheres, at first thin and membranous, gradually increase in thickness by new layers, disposed from within outwards, of soft pulpy substance, which finishes by crystalizing in fibrous substance, and by applying itself to the surface of the primarily formed fibres?

Would it not be better to say, that the fibrous substance of the hemispheres increases, in proportion as the non-fibrous, (whether of the optic thalami and corpora striata, or that of the surface of the hemispheres,) is successively secreted more abundantly, and gives origin to a greater quantity of nervous substance?

Let us follow the opinion of M. Tiédemann on the structure of the hemispheres, and on the origin of the convolutions and anfractuosities.

He says, p. 164: "The pia-mater, gradually increasing in extent, forms folds, which dip down into the soft and cerebral matter of new formations; from this, the transverse furrows and the lobules, which are perceptible at the fifth month, are derived, also the division of the cerebellum into branches, which lie upon the medullary nuclei. These formations are constantly in action, and the pia-mater also extends itself: this, again, produces new folds; then the transverse furrows become more numerous, and the branches divide into more minute ramifications, which takes place towards the age of six months. At the seventh and eighth months, the cerebral matter is secreted in very great quantity; the pia-mater yet forms again deep and superficial folds, which penetrate more or less, and lobules, branches, and ramifications not only appear, but also the minute distributions and layers.



Lastly, at the ninth month, there is deposited on the surface of the medullary leaves, a layer wholly external to the cerebral substance, filled with a number of vascular flocculi, having the appearance of velvet. Consequently, the cortical substance is applied to the surface of the cerebellum from without inwards, and it is the last production of the pia-mater."

So much for the cerebellum. And now we see as much even for the brain. Page 103, he says: "The fibres of the hemispheres being covered in a fœtus of seven months with a layer of soft substance, which adheres to the internal face of the pia-mater, into *which the folds of this membrane sink*;" and, page 259, he insists in saying: "The earliest rudiments of the convolutions and anfractuosities, that are perceived here and there in the fœtus of four months, take their origin from slight duplicatures of this membrane of the hemispheres. Most of these grooves and convolutions are formed during the last months of pregnancy, in consequence of the increase of the pia-mater, which, in enlarging, bends and sinks its folds into the soft layer of cerebral substance, which covers the external portion of the hemispheres."

I appeal to the good sense of my readers, and of M. Tiédemann himself, to treat, as it deserves, this mechanical explanation of the formation of the branches and laminæ of the cerebellum, and the convolutions and anfractuosities of the brain. 'The pia-mater is not a membrane, which, in compressing the brain, would make notches on its surface; it is a tissue of sanguineous vessels, destined to nourish, penetrate, accompany, and to excite to activity the two cerebral substances. The greatest number of these vessels, is distributed in the non-fibrous pulpy substance, placed as well within as without; the rest follow the nervous fibrils in their whole course. Let us suppose, that the tissue increases, that it forms folds. What is there that will oblige it to sink into the white fibrous substance? What establishes these depressions in such a

way, that, in the same species of animals, the same convolutions and anfractuosities constantly occur, perfectly symmetrical in the two hemispheres? What is it, that produces the folding of the leaf of corn, while it is yet enclosed in the stalk? What is that, which produces the depressions and elevations of the kernel of the nut? The same thing, which produces the convolutions and anfractuosities of the brain; a primitive law of the organization, an inherent tendency in the germ; this prevents us from wandering in the labyrinth of chimeras.

How will Tiédemann persuade us, that the cortical substance is the last production of the pia-mater? He so frequently tells us, that the pia-mater every where secretes a non-fibrous pulpy substance; that, in tearing off the pia-mater, this substance remains adherent to it, in the form of flakes. Is it not, at the present time, advancing a hazardous assertion to say, that this same substance is not the same with that, which is observed later under the form and name of cortical substance? If the skin of an animal, the rind of a fruit, the bark of a tree, are placed in the surface, are they, on that account, applied from without inwards, or from within outwards, and are they the last productions of the vascular system?

Thus, all, which Tiédemann has imagined, respecting the formation and structure of the convolutions of the brain and the laminæ of the cerebellum, is entirely contrary to the course of nature. But his ideas enable me to comprehend, how he honestly believes, page 260: "That I am deceived, when I admit that the convolutions of the cerebellum are the result of the folding of the membranes, under that form which the hemispheres originally present; and that the method that I employ to prove, that the hemispheres may be unfolded and brought back to the condition of a membrane, always causes a tearing of the internal laminæ of the cerebral peduncles; that is to say, of those which curve from without inwards, and on this account are by no means conclusive."

Where *facts* speak, reasoning is superfluous. It is true, I have little confidence in the information that I can give, to enable one of himself to unfold the hemispheres. Yet, besides referring to my large work, Vol. 1., and to our answer to the Institute of France, I shall here add some remarks.

I have said, that, after having scraped the non-fibrous substance of the corpora striata, we see very distinctly the diverging fasciculi sink deep between the converging fasciculi, which form the great commissure. In this place, there is an interlacing and decussation of the fibres. If we commence scraping at the middle line of the commissure, we can very easily follow the transverse direction of its fibres to this point. But here we are stopped, unless we force and break this interlacing. However, when we take the hemispheres, without this point, the unfolding is effected without any tearing of the fibres. The way to proceed, in order to succeed, is in this manner: we cut either a whole hemisphere, without the optic thalami and the corpora striata, or a part, for instance, the middle or posterior lobe. We begin by removing the pia-mater, and, for the greater facility, we prefer a brain where the pia-mater can be detached without tearing the convolutions, which frequently happens in brains, that are inflamed or much softened. After having removed the pia-mater, the convolutions often separate and flatten so much, that we already foresee the possibility of making them entirely level; the cerebral portion is inserted, that is to say, the convolutions on the left hand. It is well to commence on the edges, for there we see the middle of the convolutions. We proceed, lightly pressing the finger on this point, and by degrees, gently applying the force, the convolution separates into the two laminæ of which it is composed. In this way, we unfold the whole circumference of this portion. Soon we perceive small grooves, which correspond with a convolution; by pressing several times in the same

manner, with the finger on one of these grooves, it will flatten, as the convolution is unfolded : or rather take a portion of the brain on the fingers of both hands ; press gently from below with three or four fingers, and from above with the thumbs on the convolutions, bearing either externally upon the convolution or internally on the grooves, in a short time you will have only a membrane, smooth and white internally, and covered with a grey substance externally, of nearly a line in thickness, or a line and a half. The proof, that there is no tearing, is, first, that the internal surface is entirely uniform, and, in the second place, the small sanguineous vessels, which exactly follow the direction and fold of the nervous filaments, are unbroken.

By practice each one will discover the process, which he will succeed with, best. But those, who have no patience, or who are not possessed of a certain degree of dexterity, will be constantly obliged to have recourse to others, already versed in this artificial process. Hydrocephalic heads afford an excellent opportunity of observing the natural unfolding, and of proving its reality. But unfortunately, those cases, which have already effected the conviction of many anatomists, are yet neglected by others with unpardonable indifference.

Soon there will not be a single university, where there will not be one or many individuals, who have been present at this operation ; now as easy, as wonderful.

### *Conclusion.*

I have left untouched many disputed points of the work of Tiédemann ; for the present, it was only necessary for me to refute, what he and his partisans considered as essential to overturn my principles of the comparative anatomy and physiology of the brain. My readers must have perceived, that I have almost



always taken the observations of Tiédemann himself, to demonstrate my propositions ; and it is particularly in this respect, that his researches on the brain of the fœtus are extremely valuable.

As to the successive formation of the different cerebral parts, and the utility of comparative anatomy, we perfectly agree. As far as the comparative physiology of the brain is concerned, I believe that I have partly accomplished the wishes of Tiédemann. The facts, cited by him, have become for me so many confirmations, that the pulpy, gelatinous, non-fibrous substance of the nervous system, is the first secreted by the sanguineous vessels : that it is constantly in the spinal marrow, in the brain, in the nerves of sense, an apparatus, in which the nervous filaments take their origin, and where they receive their supplies.

Tiédemann, notwithstanding his dislike for the converging and diverging system of the brain, has himself been compelled to admit this double radiation of the nervous fibrils, on which we have based our opinion. Thus all our difference is reduced to the question, whether the nervous fibres of the peduncles of the brain, the optic thalami, and corpora striata, after being spread out in the hemispheres, curve uninterruptedly from without inwards, to form the commissures ; or, whether the non-fibrous substance of the surface of the brain, that which is here called cortical, gives origin to this other radiation of the medullary fibrils ? As it is impossible to prove the uninterrupted continuation of the diverging radiation ; as the cortical or non-fibrous substance every where gives origin to nervous filaments, and as, without this supply of non-fibrous substances, the fibrous mass of the hemispheres could not much exceed that of the optic thalami and corpora striata, we have adopted the last opinion, which is also evidently confirmed in the commissure of the cerebellum, in the anterior commissure, and in the great commissure of the hemispheres.

I have demonstrated, that the ideas of Tiédemann, on the structure and formation of the convolutions of the brain, and the laminæ of the cerebellum, were erroneous, that these errors have prevented him from conceiving the possibility of unfolding the hemispheres of the cerebellum and brain.

Finally, I have believed, that I could facilitate this operation with the incredulous, in giving them an idea approximating in a trifling degree to the summary arrangement of the hemispheres of the brain, by folding a bit of linen or square paper, nearly in the same manner as the cerebral region is folded and rolled upon itself.

I have then disposed of all the obstacles which, in the eyes of anatomists less versed in the anatomy of the nervous system, could yet throw some doubts on my principles of the anatomy of the brain. But let us admit, for a moment, that the fibrous substance of the nervous system, does not derive its origin or its increase from the pulpy non-fibrous substance; let us admit, that there does not exist any diverging radiated fibres, coming from the three grand cerebral ganglia, and converging radiated fibres going from the grey substance, which covers the external face of the cerebral membrane; let us admit, that all this, and the unfolding of the hemispheres into a nervous membrane, covered with a layer of non-fibrous substance, are all chimeras; what would result from this for the physiology of the brain? Would the conclusion be, that such or such other part of the brain does not exist? That the different parts are not susceptible of a different development and energy? That the mechanical aptitudes, the instincts, propensities, and faculties do not increase in proportion as the cerebral organization is more perfect? Would it follow, that the moral qualities and intellectual faculties are not innate; that their manifestation is not subordinate to material conditions, to the brain; that the different instincts, propensities, faculties, are not among them-

selves essentially different, and consequently require different organs? and so on.

The physiology of the brain ought not to be in opposition to anatomy; this ought even to come to the support of it. But physiology has been found independent of anatomy. Nothing in the physiology of the brain has been constructed on any anatomical data whatever; nothing has been interpreted by the structure or the arrangement of the cerebral parts; the anatomy of the brain has only served as a confirmation of the physiological discoveries. These discoveries are solely due to observation, to observation a thousand and a thousand times repeated, and it is only by this, that it can be judged, refuted, or confirmed. Thus, instead of having recourse to untenable subterfuges, instead of reasoning and declaiming, we must observe; the physiology of the brain disclaims every other method: it was produced, it has grown, and it will flourish under the shield of observation.

*Elementary Principles of Physiology*; by CHARLES ASMOND RUDOLPHI, &c.\*

After having rectified the ideas of Tiédemann, the justly celebrated professor of the university of Heidelberg, I ought to do the same with respect to those of Rudolphi, who also enjoys a great reputation at the university of Berlin. I will only refer to those assertions in his work, which he opposes to my physiology and anatomy of the brain.

It is frequently the case with M. Rudolphi, as with all my adversaries, that he maintains certain errors, either by adopting them from others or from hear-say evidence; it is thus that, § 251, he asserts, that

---

\* Grundriss der physiologie von Karl Asmund Rudolphi, prof. d. Med. et Phisyl. d. Konnigl. Akad. d. Wiss. Zweyter Band. Erste Abtheilung. Berlin 1s23.

the brains of the smallest carnivorous animals are the type of the largest; that they all have convolutions; in the rodentia, on the contrary, says he, they are all wanting. The convolutions are the folds of the cerebral membrane; they should then always occur, when the brain is at all complex. Let Rudolphi examine the brains of the kangaroo, the beaver, &c., and he will find the most distinct convolutions.

This professor has adopted the opinion of Tiédemann, wherein he regards the convolutions as the simple result of the dipping in of the vascular membrane to the cerebral mass. I have just exposed the absurdity of this mechanical idea, which is directly opposed to the procedure of nature. How, on this supposition, can they conceive, that the sanguineous vessels of the vascular membrane, every where accompany the nervous filaments of the white substance? But Rudolphi admits this false assertion, since he believes, that he can infer from it, that my theory on the folding of the cerebral membrane is contrary to the arrangement of the brain. "I have tried," says he, "all the manipulations indicated by Gall, in order to unfold the brain, and I have always found, that this cannot be effected but by severely lacerating it, and that the convolutions are never unfolded in a regular and natural manner, as he pretends." Rudolphi affirms, even, that he has dissected with the greatest care two hydrocephalic brains, and that he has seen nothing like this unfolding; he has only observed that the superior parts of the brain were thinner than natural, and he explains it in this manner: "the action of the accumulated water," says he, "is not so strong towards the inferior portions, where the cranium opposes a greater resistance, in consequence of its increased thickness; but it is more powerful upon the superior bones, which are more movable, and consequently yield more easily; so that the membranes and the brain become very thin in these situations; on the sides, on the contrary, and at the base of the cranium,



they remain thicker. This is certain; and Walter, Sæmmerring, Ackermann, &c., have been perfectly correct in denying the pretended unfolding of the hemispheres."

Nothing is easier than to augment the list of celebrated men and professors, who teach their pupils, that the unfolding of the convolutions of the hemispheres into a uniform membrane is absolutely impossible. They suppose, that the white fibrillæ are directed perpendicularly towards the convolutions, which would really oppose an invincible obstacle to the unfolding; but examine a large hydrocephalic head, you will see nothing torn there; but you will see, that the radiated nervous fibrillæ of the great ganglions pursue a diverging direction forward, backward, laterally, downward, and upward, precisely like the small sanguineous vessels; that they thus form the internal, white, uniform layer of the cerebral bladder. When the water is evacuated, you can fold and unfold this same membrane, without deranging or tearing any fibrils; since you only fold or stretch the membrane, which is the result of the unfolding, naturally brought about by the action of the effused fluid in the cavities of the hemispheres.

Those, who cannot succeed in this artificial operation, certainly have a right to say, that they have not been able to convince themselves of this by their own dexterity; but to hear them, one would believe, that they accused me of imposture and charlatanism. But I repeat what I have said in the discussion of the same subject, in the work of Tiédemann; I invite Sæmmerring, Rudolphi, Blainville, &c., &c., to come and see with their own eyes this unfolding, which is so inconceivable, and, in the course of half an hour, they will be enabled to do it with as much promptitude as myself. This has fortunately happened to a number of young physicians, who did not suppose, that they were sufficiently learned to reject with impunity one of the most important discoveries in anatomy. If, even

in the two hydrocephalic cases, Rudolphi has not been able to discover the unfolding of the hemispheres, after having been so correctly informed of them, let him recollect the *dictum* of Vicq-d'Azyr, that, in order to see well in anatomy, something more is requisite than two eyes. Walter of Berlin also maintains the same opinion, founded on hydrocephalic cases, all the entire crania of which we saw unopened in his museum.

§ 252, Rudolphi also doubts, whether the nerves of the vertebral column derive their origin from the grey substance, placed in the interior of the spinal marrow. We must also admit, that he has not seen this anatomical fact; but we have seen it, and so well too, that in carefully drawing out the moderately strong nervous fibres from the longitudinal grooves from which they arise, there remains a small bulb of this grey substance adherent to them. There is but a single law for the origin and increase of the nervous fibrils; every where they arise from and strengthen themselves with the grey substance, which is not fibrous. This is evidently seen in the annular protuberance, in the *soi-disant* optic couches, and corpora striata, in the bulb of the olfactory nerve, in the grey band of the auditory nerve, &c., &c., and in approaching nearer the spinal marrow, we can see most distinctly the third pair, forming its trunk from filaments, which come out in a converging manner from the black substance, situated within the bifurcation of the cerebral crura. Finally, why does there always exist a more considerable collection of grey substance in those situations, where the spinal nerves arise, and why is it that this non-fibrous, grey substance is always in proportion to the size of the nerves, arising from it? But I forget that these protuberances, of which the nervous system of voluntary motion is composed, from the caterpillar to man, have not been seen by a great number of celebrated anatomists, and that this same grey substance, having at first only the consistence of

a transparent fluid, has not been admitted as such by Tiédemann?

It is especially at § 253, that Rudolphi discovers his knowledge of the organization of the brain. He admits, that the fibrils come from various directions to the annular protuberance; that, from this part they are continued to the optic couches, the corpora striata, and the lateral masses of the brain. Then he believes, that these horizontal fibres of the great commissure go to the hemispheres; that, from this commissure, the laminæ of the septum descend towards the fornix, which itself forms many connexions by means of its relations (*Mit seinen Schenkeln*); that the cerebellum, organized in a particular manner, dips into the annular protuberance by means of many horizontal bands; that this same cerebellum appropriates to itself a part of the fibrils of the medulla spinalis, and connects itself with the brain by means of particular fibrils and lamellæ. "Finally," says he, "if we regard the tuberculæ quadrigeminæ and their connexions; the pineal gland with its prolongations; the appendix of the brain, &c., &c., we shall observe such a connexion of fibrils, as will authorize us to believe, that these same fibres never change their direction. On the other hand, I believe that we shall find there a very important argument for the unity of the brain; for, there exists here a much more intimate interlacing than in the muscular fibres of the cavities of the heart, and in no point are they separated, as in the cavities and auricles of this last organ."

We perceive how defective and confused are the ideas of Rudolphi on the organization of the brain. We have here no connexion in the direction of the nervous fibrils; sometimes, he considers the brain from above downwards; sometimes, from below upwards; no law for the origin or increase of the white fibrous substance; in general, we perceive vague, erroneous, vacillating, contradictory, and indigested notions; and, after having spoken of the different, very distinct,

and separate parts ; after having recognised the different directions of their fibrils ; after having admitted, that the direction of these same fibrils is exactly the same ; after having adverted to many very distinct portions, entirely separated from each other, he falls at once into the conclusion, that the brain is but a single organ in all its parts, where all is mingled and concentrated in a single uniform mass ! This wonderful logic recalls to my mind that of M. Richerand, in his new *Elements of Physiology*, eighth edition, Vol. x. p. 166. After having said, that we can conjecture with a good deal of probability, that each perception, each class of ideas, each faculty of the understanding, belongs to such or such part of the brain ; after having maintained, that it is impossible to study so combined an arrangement of the different integral parts of the brain, and to believe that it is not the effect of design, and that this division of the cerebral mass into so many distinct parts, so differently formed, does not relate to the different part, that each ought to perform in the mental operations ; after all this, M. Richerand has also found there a strong argument, to prove the frivolity of my doctrine of the plurality of cerebral organs. It is thus, that great geniuses of all ages agree. Rudolphi asserts with Richerand, in a note to the same paragraph, that in different individuals, certain parts of the brain are more or less developed, and that the differences in dispositions and faculties probably depend on modifications of the development of different cerebral parts. Is not this language equivalent to an admission, that the different integral parts of the brain have each a different function ?

Notwithstanding this vacillation, Rudolphi persists, § 263, in denying, that the brain is an aggregate of different organs. He says, that he has compared the external signs of the organs, with the convolutions which correspond to them, and that this comparison has shown to him, that, sometimes, many convolutions



belong to the same function, and that, sometimes, the functions of other convolutions are unknown.

We ourselves have very often compared the external form of an organ, with the cerebral part, the considerable development of which has produced this form, and we have always found a perfect correspondence between them, as I have frequently said in this work ; but I have also said, that I did not as yet know the functions of all the cerebral parts ; that, consequently, there were discoveries yet to be made ; finally, I have more than once avowed, that it was as yet absolutely impossible for me, to circumscribe exactly the extent of each organ ; I have even urged this consideration with those, who have believed that, in removing such or such parts of the brain, they would be enabled to learn its function.

“Let any one show Gall,” continues Rudolphi, “the organs of robbery, murder, religious sentiment, separated from the cerebral mass ; certainly he cannot do it.” Let any one show Rudolphi portions of the medulla spinalis and oblongata ; certainly he cannot distinguish them ; it has been, however, well demonstrated, that these parts are aggregates of different nerves. But still, this argument has enabled me to demonstrate, that it is impossible to learn from an inspection of the brain, the function of any cerebral part whatever.

When Rudolphi speaks of the different functions of the pineal gland, the corpora striata, he implicitly admits the plurality of the cerebral organs. On the other hand, notwithstanding the most definite answer that I have given to his former objections, he is not, as yet, able to understand the difference that exists, between an entire organ, and the different apparatus which compose it. He, who attributes another function to the different origins of the optic nerve, than that of concurring to the formation of the optic nerve itself,—to the bulb of the olfactory, another function, than that of serving to the formation of the

olfactory nerve, shows that he is altogether a stranger to the laws of organization of the nervous system.

In the notes to the same paragraph, Rudolphi still, as formerly, denies, that the brains of animals are less complicated than the brain of man; and, § 225, he has maintained, that in animals the cerebral part placed behind the forehead, and a great portion of the posterior lobes, are wanting. Mistakes of this kind can only be committed, when we are pursuing a false path. For an answer to all this, I refer Rudolphi to Vol. II. page 368, edition in 8vo., and Vol. II. page 367, 4to edition.

It is in vain, that we demonstrate to the adversaries of the plurality of organs, that, from the lowest species of animals up to man, the cerebrum becomes more and more complicated; in vain do we show them the brains of fishes, amphibious animals, the mammalia, and, among these last, those of the inferior and superior species; those of carnivorous and frugivorous animals; in vain do we point out to them that of the monkey, where the convolutions, both anterior and lateral, are much less numerous than in man; in vain do we prove to them, by comparative anatomy, that the brains of animals are so much less complicated, or, that there are as many natural mutilations in them, as the number of their instincts, propensities, and faculties, diminishes. Obstinately bent on explaining the simplicity of the *moi*, they see in all these incontestable facts nothing but a diminution of the simple cerebral mass, which, according to them, is absolutely the same, belonging to the same function in all its parts, in all animals and in man. Rudolphi supports his position, by referring to the brain of the embryo before even the convolutions are formed. I will admit this proof, so soon as Rudolphi shall have shown me the brain of an embryo, that has possessed any moral quality or intellectual faculty. If, however, Rudolphi wishes to adduce the brains of embryos, he ought also to recollect, that Carus and Tiédemann prove de-

cisively by them the greater or less complexity of the different brains of animals, and that they maintain, that the brain of the fœtus successively passes through the different degrees of composition of the different species of animals, until that, which may be, for instance, the brain of a fish, shall come, by the successive development of new parts, to the condition of the human brain.

It is in this way, that Rudolphi flatters himself, that he has refuted my anatomical proofs of the plurality of the organs. Yet he has passed in silence, not only a third proof, but also a great number of objections with my answers.

Among the physiological proofs, he does not admit, that the instincts, propensities, and faculties, that are essentially different, require different organs. "Who knows," says he, "who can affirm, that this is necessary, and that the mind has need of different cerebral parts? Perhaps a larger brain, being a more powerful apparatus, is sufficient for it." The cerebral apparatus is heavier and more powerful in the elephant and the porpoise; would Rudolphi measure the energy of their minds? Can we not ask, with as much reason as the metaphysicians maintain, who knows, who can affirm, whether the mind, that pretended independent agent, has need of any cerebral mass whatever? A transcendental philosopher is assured, from the knowledge that he has of the soul, that the mind of Newton would have performed the same prodigies, had it been placed in the brain of a frog. Rudolphi does not believe this, considering the weakness of the apparatus. Neither does he think, that we should compare beasts with man. According to him, it is only the mind of animals, that requires different cerebral parts for the manifestation of their different mechanical aptitudes, their instincts, &c. For man, the Creator would have been able, perhaps ought, to have constituted his mind, entirely independent of this vile, inert matter.

I have mentioned, as a second physiological proof, that one species of animals is endowed with qualities and faculties, of which another species is deprived ; which would be impossible, if the whole cerebral mass was but a single organ, or rather, if each essentially different function, was not peculiar to a particular cerebral part. "But," says Rudolphi, "these particular parts are no where demonstrated." This professor manifests by this, that he has never compared two brains of two different species of animals. Let him compare the brains of the dog and cat, he will perceive quite a different number of convolutions, a totally different arrangement ; let him compare the middle lobe of the brain of the ox, the middle lobe of that of the dog, wolf, tiger, &c. ; let him compare the brain of the hen with that of the crow, the brain of the pigeon with that of the hawk, and, if he does not constantly find the material cerebral cause of the difference of their instincts, in accordance with my discoveries, if all comparative anatomy does not disclose to him a difference in the brain, where there is a difference of instinct, I will console myself for his blindness, in saying : *non omnia possumus omnes*.

We are not now speaking of modifications of the same quality, for instance, the singing of different species of birds ; the question is of the instincts, propensities, and essentially distinct faculties, such as I have ascertained them. Is there a single organ in the living organism, which governs two essentially different functions ? Does the auditory nerve see ? Do the kidneys secrete bile ? the stomach, respire ? I see one animal without eyes, hence I conclude that he does not see ; in another, I find no olfactory nerve, I conclude, that he is deprived of the faculty of smell, &c. ; if I see different species of animals, some of which build and others do not, some of which sing and others do not, the metaphysicians complain, that I suppose in some, the existence of organs of which others are deprived.



“If these organs exist,” says Rudolphi again, “animals cannot be changed by instruction.” As I have fully answered all these objections, I refer the reader to the previous volumes. Now it remains for Rudolphi to prove, that all the species of animals, either have a different mind or soul, or, that they all possess, either by nature alone or from instruction, essentially the same qualities and faculties, always proportioned, as it respects their energy, to the mass of an homogeneous brain in its whole extent.

My third physiological proof: — the qualities and faculties, which are found in all individuals of the same species, exist in these same individuals in very different degrees; which can only be explained by the different degree of development and activity of the different organs of these qualities or faculties. “But,” Rudolphi opposes to this, “we see, in all individuals of the same species, the same cerebral parts; and we see no difference, except as to the mass in general, or in certain parts of it.” In this objection, Rudolphi seems to admit, that the brain is only the same in different individuals of the same species, and not in all species, as he has just maintained. He is right; since the qualities and faculties are essentially the same in individuals of the same species, their brain ought to be essentially the same. He is again correct, when he says, that we see no difference, except as it respects the mass in general, or in certain places, that is to say, in certain parts; which means, that such or such organs are more or less developed, according as certain qualities or faculties of these individuals, are more or less energetic. Already once before has Rudolphi made a similar confession; how does such a conscientious admission accord with denials, so formally made on the same subject?

Thus compelled to make certain concessions, as it were, by surprise, Rudolphi appears to solace himself in saying, that we do not know the signification of these individual differences. No one will dispute this

with him, provided he only speaks of himself and the adversaries of organology ; still, these differences have a signification ; and are they not of sufficient consequence to engage anatomists in their study ? And if Spurzheim and myself, and so many others, affirm that we have learnt to interpret these differences of development of the different cerebral parts, would it not be decorous, instead of denying, with such haughty superciliousness, such interesting relations, to examine without prejudice how far observation confirms my pretended discoveries ?

In my fourth proof, I have developed the following proposition : in the same individual, the different primitive and fundamental qualities exist in different degrees ; which would not be the case, if each primitive quality did not depend upon a particular organ.

“ But,” says Rudolphi, “ this difference of propensities and faculties does not take place, as a general rule. Whoever is eminently a man of genius, as Goëthe, for instance, has brought to perfection every thing that he has undertaken with ardor, whilst a feeble intellect is never distinguished. They talk of great musicians, who in all other respects are extremely limited in mental capacity ; but, if they really were great musicians, they would not be so ; they perhaps devote themselves entirely to music, and neglect all other pursuits. The cunning man deems all those foolish, who take no interest in his craftiness, or that despise it. There always exists a certain equality of faculties and propensities, provided we do not judge by the superficial opinions of the multitude.”

Rudolphi, in this objection, is not correct. It is certain, that those and even great geniuses, who devote themselves exclusively to a single object, are necessarily very ignorant in other respects. In this manner of expression, people generally confound knowledge, instruction, or erudition, with innate talents. The greatest musicians may be ignorant of the first rudi-

ments of history ; the greatest poets may likewise be totally ignorant of the first elements of mathematics, and so on ; but this lack of knowledge does not prove, that musicians and poets are incapable of learning history and mathematics. Neither will it be denied, that an eminent genius, as we usually understand the word, genius, can unite in himself many eminent dispositions, and excel in many dissimilar things ; as a proof of this, we have Goëthe, Voltaire, Haller, &c. &c. Let us not, however, forget that many occupations, apparently very unlike, require the employment of nearly the same moral and intellectual powers. The faculty of observation, the force and promptitude of the judgment, prudence and circumspection, the exact knowledge of external data, constitute equally the genius of the physician, the general, and the diplomatist, &c.

But nothing is more true, more constant, than the different degree of the propensities and faculties in the same individual ; not a single man, not a single animal, is an exception to this. In bringing forward this proof, I wish first to direct the attention to the different power of the external senses. The same individual, that possesses excellent vision, may have the hearing or the sense of smell, very feeble. The most quarrelsome dog, that bites at every one, has often not the least propensity for the chase ; another, on the contrary, is the mildest and most peaceable animal in the world, and yet he is devoured with the desire for hunting and killing ; a cowardly bitch, without any instinct for the chase, passionately devotes herself to her young ; another abandons them with indifference, and defends the life of her master at the risk of her own. If Rudolphi denies these facts, so generally known in natural history, are we not justified in saying, that, notwithstanding his inexhaustible erudition, he is greatly wanting in the talent of observation, or is it because he has never lived intimately with any animal ? Among animals, he certainly will not say

that *perhaps* such a dog, horse, cat, respire but for a single object.

Animals, pretends Rudolphi, prove nothing as it respects man ; — well, animals require many organs for the difference of their instincts ; who knows, if the mind of man requires organs at all ? But it is useless to insist again on this last point ; let us see if man manifests the same phenomena, as animals.

If you have ever been a parent or teacher, you cannot have failed to remark, that such a child or pupil has certain predominant intellectual or moral dispositions, which cannot rationally be accounted for, either by education or preceding exclusive application ; that, in many instances, it is even impossible to divest these children of their natural tastes and inspire them with others ; it is even the earliest foundation of a good education, to learn and profitably manage the strongly marked dispositions of children. Every day we see young people, who have an astonishing faculty of learning by heart, and who are wanting in intelligence ; others, who are remarkable for their intelligence, but have great difficulty in committing to memory : such an one has a good memory for dates, and none for localities ; another forgets individuals, and remembers a concert, &c. &c. There is not a single individual, even of the most limited capacity, that does not disprove the assertion of Rudolphi.

Furthermore, if this professor would come to the determination to observe the organization of the brain and head, he would sometimes see an individual, in whom the anterior region had acquired a very great development, and the posterior region, on the contrary, a very small one ; sometimes he would see another individual, in whom quite the contrary had taken place ; he would see other individuals, in whom one cerebral part predominated, and another was arrested in its development. This method is the only one, that will explain the difference in the propensities and faculties in the same individual, and which absolves us from



the necessity of referring to the biographies of all the great men, and of having recourse to *perhaps's*, sophisms, assertions, and gratuitous denials.

Finally, since Rudolphi admits, that there are men of genius and fools, and that these last, with all possible care, can never rise above mediocrity, is it to a good or evil caprice of their mind, which *perhaps* does not require organs, that we must attribute this difference? As it respects men of genius, will Rudolphi maintain with M., H., or Z., editors of the *Journal des Debats*, that it is fathers, teachers, sovereigns, that make great musicians, architects, painters, poets, generals?

Fifth proof for the plurality of the cerebral organs : the essentially different functions of the brain do not manifest themselves simultaneously, either in man or animals. Some are constantly observed, while others appear or cease to be manifested, as they are influenced by different seasons or ages, which phenomena could not occur, if all the functions depended on a single or homogeneous organ.

Rudolphi brings forward, for the third time at least, the same objection to this proof: "the child," says he, "begins by receiving impressions ; it is only after he has seen much or read much, that he can commence comparing and judging ; judgment then will be subsequent to impressions ; for, he supposes acquired knowledge. It is the same with all the faculties of the mind ; they cannot be developed until the conditions necessary for their existence are fulfilled."

Either Rudolphi has not read my answer, vol. II, p. 228, &c., or, he lives only in his vast erudition, which prevents him from perceiving the force of my arguments ; therefore, I refer both him and my readers to them. Now he adds, that in the brain one faculty is developed after another ; for instance, memory the first, without any division of the cerebral organs taking place. If I consult the laws of my thinking principle, I reason thus ; since in the brain one fac-

ulty is developed after another ; since one can be developed before or after another, I conclude from this, that one part of the brain belongs to a different function from that, to which another belongs ; that consequently the brain is an aggregate of many organs. I have however thought, that I could perceive, that Rudolphi finds himself a little embarrassed, since he retires behind the action of the mind (*Geistiges Wirken*), and refers his reader to his psychology (*Seelen Leben*.) An excellent method of conciliating the minds of the spiritualist ! In the mean time, the mind appears to me to be less a spiritualist, than the spiritualists themselves ; it knows that, in early infancy, the brain is not yet sufficiently developed ; and on this account it remains in absolute inaction. In proportion as the different cerebral parts are developed, it is partially produced upon the scene ; it plays its entire part as soon as the brain is entirely developed ; then, in proportion as this last is enfeebled, it is more retiring, and, when the period of decrepitude arrives, it leaves the stage entirely ; when the brain is in inaction, so in sleep, fainting, the mind reposes also : when there is a very great or very little development, either of the whole brain, or of particular parts of it, it is either entirely or partially embarrassed or imbecile ; when the brain is affected by intoxication or inflammation, the mind manifests its disordered state by delirium and insanity ; this is the independent spiritual action of the mind !

Sixth proof of the plurality of organs : a long continued action of the mind does not equally fatigue all the intellectual faculties ; the principal weariness is partial, so that we can continue our occupations, provided we change the subject in which we are engaged. This would be impossible if, in any occupation of the mind whatever, the whole brain was equally active.

Here again Rudolphi reproduces the same objection, to which I have replied in the second volume, pages 438 and 443. He is either ignorant of any

answer, or he intentionally leaves his readers ignorant of it. "The same thing," adds he, "happens for all the other organs, of which every one admits the *unity*. The same exertion fatigues, and change of action revives, until finally total repose becomes necessary. We can also pass from a severe mental exertion to one of less intensity, and finally, to absolute repose. This rest would not be necessary, if every time other organs were in activity. Our *moi* knows very well, that it is constantly in action, and a repose, which is not brought about by fatigue, brings ennui; in what cerebral part must we seek this on the hypothesis of Gall?"

On the hypothesis of Rudolphi, how can you conceive of the fatigue of the independent *moi*, the ennui of a *moi* essentially and constantly active? Multiply, gentlemen professors, more and more the occult powers; personify life, vital power, the *moi*, &c.; deprive us of these miserable material organs, the nerves and the brain; then will the physiology of the brain become simple?

And these organs, the unity of which no one denies, where are they? Is it the eye, is it the organ of hearing? Let us hear a very learned professor of the university of Berlin, M. Rudolphi; in speaking of taste, page 283, he thus expresses himself, and with great truth; "the tongue tastes on its whole surface, and particularly on its edges; yet at its tip the savor of the same substances is not the same, as on its anterior and posterior parts, as many authors have already observed. Certain kinds of savor are more developed, either on the anterior or posterior part of the tongue." And he derives this difference of taste from the difference of the nervous papillæ. Is it thus then that Rudolphi demonstrates the *unity* of the other organs!

Finally, I have spoken of the origin of certain mental diseases, and of the method of their cure; I have referred to monomania, or partial mental diseases, and I have taken them as two new proofs of the plu-

rality of the cerebral organs, in giving to the explanation of these phenomena a great physiological and pathological development. Vol. II. p. 443, 450, &c.

Rudolphi says, on the contrary: "No one will be of the opinion of Gall. By a singular incoherency, he takes for example the organ of music; is the musician perfect in every thing," says he? "is there not perhaps wanting in him delicacy, a taste for the simple, for the sublime, in his lessons? All musicians accuse each other of having false ideas in their art. Does not one stomach digest meats very well, and another very ill? Where is the man that does not deceive himself, even in the objects of his studies? Does not this happen to Gall in his work; does not the same thing happen to the author of this physiology? If all the different fixed ideas required a particular organ, there would be millions; but, slight modifications of the same parts suffice for their production."

If Rudolphi had read, or if he had had the courage to inform his readers of my answer to these same objections, vol. II. p. 462, 498, vol. II. p. 428, 449, quarto edition, he would certainly have dispensed with this unconnected raving, altogether unworthy of him. It is the duty of an author, especially if he is a professor, to acquaint his pupils with the true opinions of those whom he pretends to refute, the motives or the proofs of these opinions, and the answers given to objections made by adversaries. But Rudolphi, like all my antagonists, has not fulfilled this obligation; and this conduct will always be the signal of the triumph of the physiology of the brain.

Let us now see what are the ideas of Rudolphi on the functions or the value of the brain:

"Let us suppose," says he, "what however I do not admit, that the brain is provided with particular organs for its special operations; we are compelled to admit, that we are not acquainted with any. All that we can with assurance admit is, that certain cerebral parts are in immediate connexion with the external



senses ; but this cannot be demonstrated for the organ of visions, but with the optic thalami, corpora geniculata, and in part with the anterior pair of the corpora quadrigemina, and, as it respects the olfactory nerve, the bulb of this nerve, and the anterior lobes of the brain. It is not now certain, whether the sides of the fourth ventricle are the central organ of the auditory nerve. Then we know, that lesions of the superior region of the brain (in going from the corpora striata) cause a paralysis of the opposite side ; that lesions of the annular protuberance destroy the equilibrium between the anterior and posterior half of the brain. On the contrary, nothing is known of the organs of Gall. It is true, Gall believes, that he has discovered a great number, and that he has many times perfectly demonstrated them. But the source of his pretended knowledge is an untenable cranioscopy. He believes that he can find the same form of head in men, who are distinguished by a common quality or faculty ; for example, the talent for music, memory of words, &c. ; and, when a part of the cranium is protuberant, he believes that the cerebral part, situated behind this protuberance is greatly developed, and that the talent in question depends on this part. *Vice versâ*, he pretends, that this protuberance does not exist, when the talent is wanting ; on this account he was obliged to place all the organs on the surface of the brain. The facts, favorable to his hypothesis, were placed in a strong light, while those contrary to it were kept out of sight, which proves the nullity of the whole of his system. When, for example, any one had a portion of his cranium, which denotes a certain talent strongly developed, without the actual possession of it, the answer is, that the disposition to this talent is very strong, but the talent has not been developed ; yet this great disposition ought necessarily to have effected the development of the talent. So also, when in any one who possesses a talent to an extraordinary degree, the part of the cranium, corresponding to this

talent not being prominent, he escapes behind this miserable subterfuge, that the disposition is in reality feeble, but that education or application has occasioned the great development of the talent."

Rudolphi and Ackermann, since they impute to me this method of procedure, probably find it very convenient. A large number of those, who only know my discoveries by report, in their ignorance of better means, imagine that things go on in this way. I invite then Rudolphi to read, in my works, first the preface, the introduction, the exposition of the means that I have constantly employed, to discover the fundamental powers and the seat of their organs; my discourse on the difficulties of making these discoveries; my treatise on the influence of the brain, on the cranium in different ages, in health and disease; the history of the discovery of each faculty and the seat of its organ; finally, the particular treatises on each fundamental power, with the numerous proofs derived from man and a multitude of animals, and he will be astonished, if not at the uncandid manner, at least for the imprudent levity, with which he presents my works to his readers and auditors.

Every line of what he pretends to know of the anatomy and physiology of the brain, reveals his profound ignorance, and the most ridiculous pretension, that no one knows that, of which he is ignorant.

"I have had occasion," continues Rudolphi, "to examine many hundreds of brains; but I have never found any thing which was in accordance with the theory of Gall. Almost always I have found congestions; very often, an effusion of water, of a plastic lymph, of blood; very often, inflammation of the membranes; very rarely, inflammation of the cerebral substance itself; softenings of a greater or less extent, but always irregular; very often, indurations (principally in scrofulous individuals); once, an induration of the whole annular protuberance; sometimes, other tumors," &c.

Happily, the authority of Rudolphi is not of the first order. There are so many very true and positive anatomical facts, that he has not seen, or that he has wrongly seen ! For instance, he has not seen the series of prominences in the spinal marrow ; the true decussation or interlacing of the pyramids ; he has not seen the natural unfolding of the hemispheres in hydrocephalic subjects ; he has not properly observed the organization of the cerebellum and the annular protuberance, the formation of the great commissure of the hemispheres ; he has not been able to see the artificial unfolding of the brain and cerebellum, the origin of the optic nerve ; the relations of the brain itself, with the different brains of the different species of animals, &c. &c. In general, Rudolphi sees very little by himself ; he adopts or denies by his learning. I will wager, that, at this very moment, he does not perceive that, as a general rule, the cerebellum is much smaller in proportion to the brain before the age of puberty, than in the adult period ; that, in old age, the cavity of the cranium becomes more narrow, and that the convolutions of the brain are more flaccid and soft ; that, in woman, the posterior lobes generally extend farther beyond the cerebellum, than in man, &c. &c.

How many things could I cite, that anatomists and physiologists did not see, a few years since, which all men, versed in new discoveries, see now ? In order to see, we must have complete and exact ideas, we must have principles derived from the organization itself, and, finally, we must have learned to see.

Rudolphi reproaches me with having made changes in the organs. If I had written earlier, certainly I should have made many more. I have never wished to be talked about ; from this very day, whoever will convince me of the falsity of all my discoveries, I will be the first to announce it to the public. Truth is my object. I place that above all personal and exterior considerations. May all my adversaries follow my example !

This professor also attempts to invalidate the stability of my fundamental qualities and faculties, and the seat of their organs, because M. Spurzheim has introduced some modifications into the physiology of the brain. I have already replied to this idea of M. Jourdan; if such an argument was of any weight, what would become of all the objections of my antagonists? There is not one, that has not been contradicted, undervalued, or refuted by one or the other of them. In their view, it is only their own arguments that have great weight.

Finally, Rudolphi enumerates the fundamental powers, as I have established them. He says that I accord vices and virtues to animals. Vice and virtue suppose moral motives, of which the most noble animals have, perhaps, but a very obscure notion. But Rudolphi (in his zeal for the rights of man) has confounded good and bad qualities with vice and virtue.

To prove the nullity of all these discoveries, Rudolphi undertakes to refute the existence of the organ of the propensity for propagation. Among my proofs he cites, that the cerebellum is greater, when this propensity is the most imperious, and during the rutting season of animals, and smaller, on the contrary, in those that are castrated and mules; that in those addicted to onanism, the cerebellum diminishes and becomes painful; that the propensity to propagation loses its energy after lesions of the cerebellum. The reader, who may desire to refer again to my treatise on the propensity to propagation, will see that Rudolphi has hardly glanced at my arguments. But this is of no consequence, for, in conformity with his expeditious habit, he opposes me, 1st. in maintaining that the cerebellum is smaller in animals than in man, without there existing in them less energy of the propensity for copulation. How powerful, says he, is this propensity in birds, in whom the brain is so small, compared with that of mammalia, and especially in comparison with that of man?



Rudolphi has, then, entirely forgotten what I said, vol. II. p. 280, octavo edition, and vol. II. p. 318, quarto edition, on the absolute size of the brain and its parts, compared with their functions. From the ideas of this professor, it would be difficult to conceive how ants, bees, &c., can have the instincts of propagation, love of young, construction, self-defence, laying up provisions, &c. He confounds the brain of birds with their cerebellum, and he does not remember that birds, like most mammalia, have but a single season for their loves, whilst man is influenced by this propensity both in winter and summer, autumn and spring, often from before the age of puberty, even to old age.

“2d. All trace of cerebellum disappears in moluscosous animals and worms, &c., and also in those, lower in the series of beings, and yet we see them all influenced by this propensity.”

So long as there exists a cerebellum in any animal whatever, there is a multiplication of their species by copulation, or an analogous act. When the cerebellum no longer exists, no longer is there any connexion between the sexes; let Rudolphi demonstrate to me the contrary of this.

“3d. If we consider the large development of the cerebellum in man, we cannot refuse to admit, that this part possesses a great proportion of the perfection of the organ of the mind.”

The perfection of the organ of the mind depends on the perfection of the brain and its particular or specific action, and this same brain is not only the agent of the superior faculties of the mind, but it is also of the sentiments and propensities; the first, the most imperious, the most indispensable of these propensities, belongs to the cerebellum.

“4th. Cretins, in whom the cerebellum is small, are more or less imbecile, whilst the venereal propensity is often exalted to erotic mania.”

Again, Rudolphi does not in the least regard what

I have said, vol. III. p. 333, octavo edition, and vol. III. p. 131, quarto edition, on the activity or inaction of the instinct of propagation in idiotism. He would have seen, among other things, that in salacious cretins the cerebellum has always a very great development; that, on the contrary, in those cretins that have no propensity of the kind, the cerebellum is very small. Thus, Rudolphi decides upon a question, that he has never examined in different cretins themselves.

“5th. Lesions of the posterior parts of the head easily bring about a want of memory,” &c.

What memory? And lesions of the posterior parts of the head, are they lesions of the cerebellum? Rudolphi has probably read, that a certain pedagogue placed memory in the posterior part of the head. We have always erudition without personal examination.

“6th. It is not the cerebellum, but the spinal marrow, which suffers immediately by the abuse of physical love. Hence, there results dorsal consumption, with paralysis of the lower extremities.”

In these cases, can we presume that Rudolphi has examined both the cerebellum and spinal marrow, when he tells us that there is only atrophía of this last, and, not of the cerebellum?

“7th. That which Gall advances concerning the increase of size of the cerebellum, during the rutting season, has never been demonstrated by experience; but he has confounded the swelling of the neck and nape with the size of the cerebellum.”

I am very far from denying, that Rudolphi has never observed this increased nervous turgescence of the cerebellum, during the rutting season, or during the loves of animals. For this, it would have required a considerable collection of heads and brains of animals, killed in the moment of heat, to compare them with as many brains of animals, destroyed in the opposite season. It would be difficult for so learned a man, to have recourse to so laborious a source of true knowledge.

Finally, Rudolphi continues, that consequently I am deceived, as to the function of the cerebellum, as of the other parts. In the mean time, he has found it convenient to make no mention of the history of this discovery, of observations already made previously to mine, by Hippocrates, Apollonius of Rhodes, Van Der Haar, Tissot, &c. He says nothing of successive manifestation, increase and decrease of the instinct of propagation, always in direct relation with the development and decrease of the cerebellum in the different ages; of the very energetic activity of the instinct of propagation, in the period even of infancy, when the cerebellum has acquired an excessive premature development, whether the sexual parts are developed or not. He never has attempted any verification, nor spoken of our experiments made on men and animals, respecting the degree of their instinct for physical love. Has he compared the cerebellum, or the external sign of extremely amorous individuals, with others, who have no idea of the difference of sexes? Has he examined individuals, who were powerfully excited to the commission of certain vices, that are punishable with death in England? Has he made similar researches among animals extremely amorous, in comparison with other individuals of the same species, but quite indifferent in respect to this act? Has he compared the cerebellum of males with that of females, as it regards the different degree of the propensity to propagation; for instance, the dog and the bitch, the bull and cow, the stallion and mare? Has he compared the cerebellum of man with that of woman? Has he ever given any attention to the kind of caresses, which many animals make to excite the venereal act? Has he ever made any observations on the influence of castration, whether entire, partial, or unilateral, on the cerebellum? As a physician and physiologist, has he observed the influence of the lesion and the diseases of the sexual parts on the cerebellum, and the lesion and diseases of the cerebel-

lum, on the sexual parts? Does he know the cause of erotic mania? What does he think of those cases, where the instinct of propagation survives the destruction of the genital parts, and exists in the absence of these parts? Does he know the nature of apoplexies, so frequent after or during a very ardent act of copulation? These are so many questions, resolved in my treatise on this instinct and its organ, but which weary the patience of the antagonists of the physiology of the brain.

In treating of the functions of the external senses, Rudolphi cannot conceive, page 284, how I can attribute to animals an organ of taste of greater extent, than belongs to man. He maintains, that most animals have no taste, and that the very few of those who do taste, have the faculty very imperfectly; according to him, we find nothing remarkable in the cavity of their mouth, and in those that swallow their food whole, there certainly can be no taste. Animals do not taste in chewing and swallowing their food; it is only in ruminating, that they perceive savory substances; formerly, it was the sense of smell that directed them; thus, says he, birds of prey swallow little animals without tearing them; the *échâsses* and *palmipèdes*, the insectivorous and graminivorous animals swallow frogs, insects, and grains, whole; there are but a very few animals, that enjoy the sense of taste to such a degree as the parrot.

As my treatise, on the functions of the external senses, is not in this edition of my works, I will copy from the large edition, the following passage, which served as an answer to an objection of professor Ackermann, and which affords us the extent of the opinion of Rudolphi.

Professor Ackermann, causing the perfection of the intellectual faculties of man to be derived from the delicacy of his senses, maintains, that the nerve of taste is proportionally larger in man, than in animals; that in him, it is spread out on a softer and more mov-



able tongue, the nervous papillæ of which are covered with a much finer epidermis than in animals. But, proportionally, the gustatory nerve and all the fifth pair are very distinctly greater in animals, than man. The nervous papillæ in multiplied forms, disseminated in the pharynx, the palate, on the whole tongue, the internal surfaces of the cheeks and the lips, are much larger and more numerous than in animals. In order to make the surface of the organ of taste more extensive, the palate, in many animals, is covered with a membrane, grooved and studded with numerous nervous papillæ; and, in general, the apparatus, which serves for the action of eating, is more extensive in them than in man. In the dog, bear, monkeys, the epidermis of the tongue is as fine, as that of the tongue in man; if this organ in us is more movable than that of animals, this property is only connected with the faculty of speech, and has nothing to do with taste. Besides, if we reflect that, in the action of eating, the organs of animals procure for them the most intimate and enduring pleasure; that a great number of them, when they are awake, spend nearly all their time in eating or ruminating; it will be difficult not to admit, in animals, a more perfect and extended taste. Consequently, whoever shall be disposed to expect, from a better organization of taste, intellectual faculties, in some respects more perfect, ought at least to let us know, what are the alimentary preparations invented by the dog or ox.

We cannot admit the general opinion, that birds have an obtuse taste; at least, it seems to us impossible, that all are in this condition. Blumenbach has found the organ of taste in the duck, comparatively much larger than in the goose; so also we observe that the palate of many birds, such as birds of prey, heath-cock, &c., is garnished with nervous papillæ, very numerous and strong. A great number of birds do not swallow their food at once; the tom-tits, for instance, in a manner lick it; most birds, that live on

insects and grains, crush and bruise them ; what reason should we have in this case, to attribute to them a less perfect taste than other animals ? Let any one give to the canary bird, bullfinch, nightingale, or cuckoo, many different kinds of food, each will select without fail, that which he likes best ; the canary prefers dogs-grass ; if we give to nightingales, that are newly caught, the larvæ of ants, a great number will die of hunger, because they do not know the kind of food ; if we put them in their beak, they usually reject them ; but if we crush them, they swallow them with avidity. This evidently proves, that they have a very delicate taste.

Birds even that swallow their food at once, such as hens, pigeons, &c., distinguish berries and grains by touching them with the end of their beak. Let any one mix the grains of vetch with those of the *robinia caragana*, the *cytissus* of the Alps, &c., the hens and pigeons will take them all without distinction, but they will soon reject the two last. Thus the horny extremity of the tongue does not exclude taste ; it seems on the contrary to be a prolongation of the lingual nerve, destined to give this part a more delicate taste. If storks have been accustomed to receive in their beak rats and frogs, that are thrown to them, they swallow them with avidity, after having tossed them many times in the air, recaptured, and crushed them ; but if we throw them a toad, they instantly reject him ; they greedily swallow large flies and bees, but, if they catch an insect that they do not like, they reject him. Swallows and all birds, that live on insects, do the same.

It is an error, then, to suppose that a humid solution is first necessary to cause the sensation of taste. The surface of grains and insects, certainly excites on the tongue oleaginous, alkaline, spirituous impressions, that the taste instantly perceives, by means of instruments organized for this purpose. Vol. i. p. 152, quarto edition.

Add to this, that the dog, when hungry, swallows without chewing, greedily chews filberts, almonds, chestnuts ; that he laps milk with great delight ; that, like almost all other animals, he loves sugar ; that the hog and duck, who root and dabble in the mud, tear and chew roots, insects, frogs, &c. ; roebucks and pigeons, who greedily seek dirty slime ; is it possible to deny an exquisite taste to all these animals ? It is then much less conceivable, how Rudolphi can maintain, that the sense of taste is wanting in most animals.

§ 315, Rudolphi makes the greater part of the optic nerve, to arise in the so called optic thalami. "I have had occasion," says he, "to dissect the brain of an infant, in whom the right eye and orbit were wanting, while the left eye was well organized. The corpora quadrigemina were of the same size on both sides, but the left optic thalamus alone maintained its natural position and size ; the right optic thalamus formed at its inferior part a projection, from which arose a kind of appendix, a sort of rudiment of the optic nerve, which was wanting, and which was again lost in the brain. This case evidently proves, that the optic nerves do not at all derive their origin from the tuberculæ quadrigeminæ, although I do not protest, that some connexion exists between the corpora geniculata and the anterior pair of the tuberculæ quadrigeminæ for the origin of the optic nerve."

Has Rudolphi examined the proportions of the two hemispheres in the case cited ? He is certain, that, if there was a diminution of substance in the right optic thalamus, the right hemisphere ought equally to be diminished. Quite often we have met with brains, particularly in insane hospitals, where one hemisphere was smaller than the other, and this diminution always coincided with a diminution of the corresponding thalamus. We have not observed in any of these brains, a diminution or atrophy of the optic nerve, unless there was also a diminution in one side of the

tubercula quadrigemina. Besides, the optic nerve certainly does not derive the whole of its origin from the tubercles ; the internal and external corpora geniculata, &c., furnish it with a large number of nervous fibrillæ. It is on this account, that the optic nerve is not in proportion to the size of the tubercles, which, as in the mole, may be very large, with an extremely delicate optic nerve. But, what does this confused language mean ; *the optic nerve certainly does not derive its origin from the tubercles, and some connexion exists between the corpora geniculata, and the anterior pair of the corpora quadrigemina for the origin of the optic nerve?* I still oppose to the assertion of Rudolphi, that Sæmmering, Spurzheim, myself, and many others, have always seen a diminution of one side of the tubercles, when there was an atrophy in one of the optic nerves. There is not then a doubt, that, in this observation, the professor has not seen rightly.

In my large work, I have maintained that man, as well as animals, distinctly mark objects but with one eye. I have distinguished between the passive and active function of the senses. The two eyes see passively ; but every individual fixes the object with one eye only. Rudolphi pretends, § 320, that it is easy to refute me. I believe, that it is still much easier to have the assent of every reader. No one doubts, that we see with both eyes at once ; since, with the exception of a very few observers, every one confounds passive with active vision. Not to hold the reader in suspense, I shall be pardoned, if I copy from my large work, the passage relating to this subject, vol. i. p. 189, quarto edition.

We cannot conceive how, even to this day, so little attention has been given to this general fact : that all the operations of animal life, and, consequently, those of the senses, are, in certain circumstances, purely passive, and in others, purely active. In waking and sleeping, it is not possible for us to perceive or not



perceive the impressions of objects on our senses. We feel, taste, hear, see, touch, without the action of our will. In this respect, the senses are passive. It is quite different from this, when we direct our attention positively to the impressions of the senses. In smelling, tasting, hearing, seeing, feeling, our own internal activity acts upon the objects.

The double organs of the senses always contribute to cause us to receive the impressions passively, and to excite in the brain a sentiment, more or less obscure or distinct, of these impressions. We hear with two ears, and see with two eyes, when sound and light impinge upon these parts, without our express participation; but, so soon as we react actively on these objects, one only of the two organs acts. We hear attentively but with one ear; we accurately observe an object but with one eye.

We foresee, that this assertion will seem erroneous to most of our readers; and as, in our public lectures, we have always proposed to explain, in some sort, the reason why we see single with two eyes, it has frequently been opposed by our adversaries. To say that one single organ is active, while the other is at rest, is, according to Ackermann, to use a pitiful subterfuge. This professor believes, in relating an experiment which we shall cite, that he has demonstrated incontestably, that we observe objects fixedly with both eyes. Such also is the opinion of Autenrieth, and there is only a very small number of physiologists, who have been able to seize the idea, that we only see steadfastly with one eye.

Let us offer to our readers the facts, on which this assertion rests. One of us (Gall) in his youth, was fond of playing with a long tube slightly curved, through which he blew peas; he could always very accurately hit the objects aimed at; he frequently, on the contrary, failed when he used a tube perfectly straight; he could not account for this difference, until, finally, he placed the straight tube in a direct line

from his mouth to the object. Then he observed the instrument with one eye, and saw that it was directed obliquely towards the object. In connecting this fact with the circumstance, that, when firing a musket, we are obliged to place one eye in a straight line with the point of aim, he concluded, that we could not aim accurately with both eyes. Afterwards, he tried to trace a straight line in a garden, with vine props; he placed his nose upon the first, and always fixed the rest, the one exactly behind the other; but when he observed his line at the opposite extremity, he saw that the props constantly separated from each other, he could not obtain a straight line, until he placed his right eye alone upon the first prop. If we in reality aimed with both eyes, we ought, in both cases, to obtain a right line by starting from the middle of the face. He believed also, that he could explain, why the paths always proceed in a serpentine direction in snow and fields. Let any person hold a small stick, a knotting needle, a quill, or other similar body between the eyes and a candle, in order to find a straight line between himself, the stick, and candle; the shadow of the stick, if held directly opposite the candle, should necessarily fall upon the nose, when the aim is taken with both eyes open. But every time the shadow falls on a single eye, namely, on that which we are accustomed to use, when we fixedly regard an object. If this eye is closed, while the candle and stick remain in the same position, we observe that the first object is considerably separated from the straight line; if, on the contrary, the other eye is closed, the position of the stick and candle appears in the same direction. This proof contradicts that of Buffon, which we have before related, and from which he would infer, that we see every object double; but it proves most evidently, that we look fixedly but with one eye. Request any one to look attentively at a small object, at the distance of one or two feet, both the eyes appear to be equally directed

towards the object. Shut or cover one of the eyes, the other will not move at all, if it is the one with which the person is in the habit of looking accurately, but if this last is covered, the other immediately turns slightly inwards, which enables it to fix itself upon the point of observation; let then the closed eye be opened again, the other then involuntarily and unconsciously turns outwardly to the same extent, that it had previously moved inwards. This experiment proves then, that the two eyes are not equally fixed on the same object, and cannot look upon it at the same time. Even in squinting, when the object appears double, we can fix our sight but upon one of the images and with one eye; the second image is only seen passively. Animals, whose eyes are placed at the side of the head, can only look with one eye; Cuvier has also remarked this, and has concluded, that the same observation can be applied to man. In reality, man, for instance the painter, and animals that have their eyes in the front of the head, such as the dog, monkey, &c., evidently prove by their gestures and the motion of the head, sometimes on one side and sometimes on the other, that they see an object, sometimes with one eye, and sometimes with the other.

Lecat, whose excellent work would merit a revision, is the only writer, where we have found our opinion nearly expressed. "If it could so happen," says he, "that the mind should leave one of its eyes vacant, that it should use but one eye at a time, or that it should only attend to one of two images, the difficulty would be soon obviated, and it is true, that the mind generally does so. We look at an object attentively, but with the eye of that side next the object; and the other is, as it were, at rest, until its turn of activity comes to take the place of the former. I have even observed, that there are certain days, when it is almost always the turn of one eye to see objects, and I have reason to suspect, that this happens, because this eye on these days has greater vigor than the other. I am

convinced, that in many people, there is always one eye stronger or more watchful than the other, and which constantly takes charge of the greatest part of the common task." Lecat, however, believes, that this kind of one-eyed vision is not universal, and he undertakes to prove, that we also see at the same time with both eyes. But, in all the experiments which have been undertaken to attain this object, he constantly confounds passive with active vision, as do also our adversaries in the objections, they urge against us.

Professor Walter of Berlin, Ackermann, and their partisans have opposed to us the following experiment to prove, that we look fixedly with both eyes. If we observe a luminous body, such as a candle, with each eye armed with a glass of a different color, the eye which looks through a red glass will see the object red, and the one armed with a blue glass will see the object blue. But the two eyes together will neither see the object red nor blue, but green, which is a compound of these two colors.

This experiment has been imagined, believed, and copied in theory, from an erroneous supposition, but has never been confirmed in practice. We have often repeated it, and caused it to be repeated by others. If the two glasses are equally thick and transparent, we see either red or blue, as we have been accustomed to look fixedly with one or the other eye. But if one glass is thinner or more transparent than the other, its color alone gives the color to the object. Never have we been able to see the green color. It is true, that we see green when we look at fields and trees of this color, because the colored glasses do not entirely extinguish the green color. At the first instant we often perceive rays of a mixed color; but we should attribute this to the impression, which still remains in the eye, before which another glass has been held. It is in this way, that we often see spots



of a different color, when we carry our eyes from one object to another of a different color.

Consequently, in continuing to fix our attention on the difference between passive and active vision, it will be difficult to prove, that we can attentively observe an object otherwise than with one eye.

§ 323, M. Rudolphi comes to psychology (*Seelen Leben*) and passes rapidly over the following questions: Whether animals, monsters, and idiots have a soul; if the pieces, into which we can divide certain living beings, have each a soul; which, according to him would be incompatible with the unity of the individual, the *moi*. In opposition to Bichat he admits, that the affections have not their seat in the viscera, but solely in the brain.

He establishes three distinct manifestations of the mind: intelligence, sensation, and the appetitive faculty. The powers are not always manifested in the same manner, but are in different proportions, not only in different individuals, but also in each particular individual; he does not admit the existence of innate ideas, but, with me, innate dispositions, by means of which we arrive at abstract ideas.

After having explained his ideas of memory, judgment, imagination, the affections, passions, and having considered them according to the routine of the philosophy in vogue, he refutes physiognomy, with which he confounds pathognomy.

He terminates this paragraph by giving a mortal thrust to craniology. "Craniology," says he, "has the cranium alone for the object of its researches; it pretends to be able to know, by this, the brain, and of course the character and dispositions of men; which is absolutely false. Besides, it never despises the assistance of its elder sister, physiognomy, in creating at the same time a kind of imitation, which it merely places more in connexion with the cranium.

"Craniology has had little success, and it deserves no more confidence than chiromancy."

My readers know how to understand this, so far as craniology is concerned ; it is indeed very pleasant to observe the obstinacy of most of my adversaries, in wishing to reduce all my discoveries on the anatomy and physiology of the brain, to simple craniology ; they demonstrate by this, either their bad faith, or their complete ignorance of the true end of my labors. In denying the utility of craniology, they not only deny the plurality of the cerebral organs, the different development of these same organs, and consequently the different forms of the brains and heads, but also all influence of the brain on the form of the head, all possibility of arriving at the knowledge of the seat of the organs. And do you know why they say, that the craniologists do not despise physiognomy ? Because, that in visiting, in our travels, prisons, hospitals for the insane, &c., many professors, pupils, ministers of state, have witnessed how frequently we have determined, with the utmost precision, the nature of the crimes or the insanity and the predominating propensities and faculties, of the prisoners and the insane. In order to escape the necessity of rendering this homage to craniology, they bestow all the merit on physiognomy. But, as they neither believe in the one nor the other, how can they explain these facts ?

Yes, I have created an art of imitation founded on unshaken principles, the only one which reveals to us the mystery, the source of pathognomy, the gestures and the attitudes, that our thoughts, sentiments, propensities, internal emotions produce in us externally. Read my treatise on this principle of imitation, and you will be convinced, that each gesture that accompanies the strong action of an organ, is a proof of its seat, and consequently of the plurality of organs. But, here especially, something more is requisite than knowledge.

Let us suppose, then, that craniology, or rather the physiology of the brain, has not amounted to much, organology should have taught me not to ex-

pect much of it. Exclusive ideas, extravagancies, superstitions, futilities, fashions, make fortunes. The transcendental philosophy, metaphysics, ideology, animal magnetism, brunonianism, &c., &c., have also made fortunes. To oppose received habits, to brave the decisions of academies, to humiliate self-love, to overturn the pretended knowledge of the anatomy and physiology of the nervous system, to destroy the systems of philosophy of three thousand years, &c., how can it be expected, that one should succeed with such elements? Where is the child, that does not suffer from being weaned, even when more substantial food is given him?

Let cranioscopy, according to Rudolphi, merit no more confidence than chiromancy, this is perfectly well explained; first, he rather adopts the conclusions of others, than thinks or examines, for himself. Either M. Carus, or M. Jourdan has said so. What more is wanting?

In the second place, Rudolphi has not the slightest knowledge of the discoveries relating to the anatomy and physiology of the brain; he has not the least idea of the mechanical aptitudes, instincts, propensities, and faculties of animals, nor the fundamental moral qualities and intellectual faculties, or the philosophy of man; the comparative anatomy and physiology of the brain of man and animals, are nonentities for him. In conclusion, I refer Rudolphi to the answer which I have given to M. Jourdan, in this same volume.

*Experiments on the Nervous System of Man and Animals*, published in Italy in 1819,\* and republished in France in 1822:† by COSTER, M. D., of the Faculty of Turin.

In the third volume, I have given my own reflections on the report of Baron Cuvier, concerning the experiments of M. Flourens. M. Coster, in a translation of the work of Rolando, has answered my observations. At that time, I was unacquainted with the dissertation of M. Rolando, and the memoir of M. Flourens. Since then, I have studied their works, and the frequent contradictions in the results, which each has arrived at from the same experiments, have tended to confirm my opinion, that mutilations are the worst methods of becoming acquainted with the nervous system. M. Coster has directed his attention, first to giving credit to his old professor for some new discoveries in the anatomy and physiology of the brain. He supposes that M. Cloquet, in his descriptive anatomy, has borrowed the description of the brain from Rolando. In order to secure to the latter the priority of these discoveries, he endeavours to establish the following fact: "the course of the medullary fibres, which expand to form the hemispheres of the cerebrum and cerebellum, as discovered by Rolando, does not differ essentially from the explanation, which Drs. Gall and Spurzheim have given of it." "It might be supposed," adds M. Rolando, "that I had had some acquaintance with the exact method of these ingenious anatomists."‡ "I may add, that I confided at the same time, to Professor Palloni, Secre-

---

\* Saggio sopra la vera struttura del cervello del uomo e degl' animali, e sopra le funzioni del systema nervoso. Di Luigi Rolando, 1809.

† *Archives générales de Médecine*, tome Ier., mars 1823.

‡ Memoria sulle cause da cui dipende la vita degli esseri organizzati (Firenze, 1807).



tary of the Italian Academy, a memoir, containing the explanation of the functions of the nervous system, in all living beings, founded on their organization and on some experiments, which demonstrate the use of the different parts of the cerebral mass. Further, in my instructions in the theory and practice of medicine, I have not only, for some time, classified the diseases of the nervous system into affections of the hemispheres, of the cerebellum, of the medulla oblongata, and of the sympathetic nerve; but I have also shown, with the constant support of experiments and observations, that there is not one symptom, nor a single phenomenon, which does not meet with a ready explanation; while, in the best treatises on these diseases, all is disorder, obscurity, and confusion."

"It seems to me, that one would have no difficulty in concluding from all this, that I was acquainted with the structure of the brain, such as I have described it, long before the physicians of Vienna had published their anatomical observations; since, by the aid of this structure, I explained the functions of the encephalon before that period, as well as those morbid alterations, most difficult to understand."\* "I am far," continued M. Coster, "from wishing to insinuate, that Messrs. Gall and Spurzheim have profited by the anatomical researches of Rolando; on the contrary, I know that, at the time these celebrated anatomists published their first works, they could have had no knowledge of the work of which we treat. It is not the first time, that men of genius have, unpremeditatedly, coincided in the same point of doctrine."

If M. Rolando is sure of being able to explain, with the assistance of his discovery of the structure of the brain, the functions of this noble organ, he is certainly the happiest of mortals. But to leave here this nonsense, let us see, with what propriety he has argued his cause for the priority of his pretended discoveries.

---

\* *Saggio sulla vera struttura, &c.*, p. 89.

In the year 1807, he announced a new theory of the brain, entirely different from that, which, till that time, had been adopted by the most celebrated anatomists. The first volume of my large work, which contains the anatomy of the nervous system, together with that of the cerebrum and cerebellum, did not appear until 1809 ; but, for several years before my travels, I had constantly demonstrated the brain, according to my discoveries, to a great number of spectators, of all nations. I left Vienna on the fifth of March, 1805 ; and, immediately after, and during the whole of that year, and the years 1806 - 7, we made the same demonstration in presence of professors, pupils, and a great number of distinguished personages at Berlin, Halle, Leipzig, Jena, Dresden, Gottingen, Copenhagen, Leyden, Amsterdam, Heidelberg, Stuttgart, Carlsruhe, Brunswick, Hamburg, Munich, Frankfort, Zurich, Berne, Basle, Paris, &c. &c. During my travels, several of my hearers have published my course of lectures, not to mention all the journals which have given an account of it, as of an object of lively curiosity and general interest.

The works of Froriep, Bischoff, Ackermann, Walter, professor at Berlin ; Walther, professor at Bonn ; Bløede, Muller, Meyer of Naples, Démangeon, &c., all appeared before the year 1807. Some appeared in the same years in Italian, French, Danish, Swedish, Dutch, &c. On the fourteenth of May, 1808, we presented to the Institute of France, a memoir, containing our anatomical discoveries. The report of Messrs. Tenon, Sabatier, Portal, Pinel, and Cuvier, was sent every where ; and M. Rolando was only acquainted with my anatomical and physiological doctrine, as an absurd opinion, refuted by Malacarne ! I have been made to assert, that the brain was nothing more than a mass of cellular tissues. This trick came to my knowledge only by this passage of M. Rolando's.

A very evident proof, that M. Rolando has not appropriated my discoveries, is his exposition of the

structure of the brain. The course of the nervous fibres, which contribute to the formation of the hemispheres, is very coarsely displayed in his plates, though it had long before been much better drawn by Vieussens and Vicq-d'Azyr. He is guided by no physiological principle; such, for example, as the successive approach of animals to perfection; he acknowledges, that he has had but three brains at his disposal. He must have been very ill acquainted with this subject, to flatter himself with making discoveries without the means of multiplying, repeating, correcting, and confirming his researches. Hence arises his want of exactness in the description of the passage of the pyramids, through the pons Varolii, the thalami optici, and the corpora striata. According to him, the nervous fasciculi of the corpora striata, as in the opinion of his predecessors, contribute to the formation of the great commissure and its dependencies; thus, he did not observe the entirely different direction of the divergent and convergent fasciculi. He knew nothing farther of the corpora striata, than had always been known by every one; the external portion of them, which far exceeds what is seen in the ventricles, entirely escaped his observation. Like all anatomists before him, he makes the optic nerve arise from the thalamus opticus; and, like many anatomists before him, he makes the olfactory nerve arise from the anterior commissure; he had not even a doubt of the manner, in which this commissure is formed by the nervous fasciculi, which issue from within the anterior interior extremity of the middle lobes; how then could he doubt of the formation of the septum lucidum? Like every one else before us, he considers the eminences, from which the optic nerves arise in birds, as the same with the thalami optici, so called, in the mammifera. In like manner, he considers the simple enlargement of the medulla oblongata, as the pons Varolii. As he was acquainted with no law of the organization of the nervous system, he did not

observe that birds, reptiles, and fishes want this protuberance, which is nothing else than the union of the nervous fasciculi of the lateral lobes of the cerebellum ; now, as these animals have no lateral lobes, they could not have this union of the nervous fasciculi. Thus he had not the slightest idea of the formation of this protuberance or commissure of the cerebellum, or its decussation with the longitudinal fasciculi of the pyramids. The entire structure of the cerebellum is a great mystery to M. Rolando. Altini at first imagined it a galvanic pile, with layers of grey substance, and layers of white substance, placed alternately upon each other ; other anatomists, like Reil and Rolando, found this fiction very plausible, and adopted it. They did not know, that the cerebellum was organized according to the same law as the hemispheres ; that, in cases of dropsy of the cerebellum, its folds develope themselves, like the convolutions of the hemispheres of the brain, and that instances are not wanting, in which this development might be made artificially.

Professor Rolando also denies, that the grey substance furnishes nervous filaments ; but he admits, that it contributes to their nutrition. In general, his ideas on this subject are wavering ; this same grey substance assists in the formation of the galvanic pile ; otherwise, he adopts the opinion of Malacarne on the use of these laminæ, and makes them contribute to the perfection of intelligence. He knows no better than myself, how Malacarne counted the leaves of the cerebellum ; and, although he has only examined three cerebella, he believes, nevertheless, that he has had an opportunity of confirming the observation of this philosopher ; he has observed, that the cerebellum of an idiot was composed of only three hundred and twenty-four laminæ ; that of an intelligent man, of seven hundred !

M. Rolando asserts, that the cerebellum in animals is larger than in man. He nowhere manifests the



slightest suspicion of the cause of the optic thalami, the corpora striata, the pons Varolii, &c. ; why it is smaller in animals, such as the horse and the bull, than in man ; or why, on the contrary, the tubercula quadrigemina, &c., the medulla oblongata, &c., are larger in animals than in man ; always a result of a want of physiological principles.

Lastly, M. Rolando, on the strength of having made such multiplied researches on the brains of man and animals, finds no other difference between them, than that of volume.

In order to spare his readers the details of the description of the brain, Rolando refers them to the works of Cuvier. M. Coster has, therefore, acted very prudently, in not being willing to specify the immense discoveries of his old professor, whom he has styled a modest professor, because he has not said, what he did not know. Thus, this pompous announcement of the new doctrine of the brain, entirely different from any which had been hitherto advanced by the most celebrated anatomists, reduces itself to this, that M. Rolando has not avoided a single received error, nor made the most inconsiderable discovery in the anatomy of the brain. I could never have credited this surprising result, had I not myself read M. Rolando's original work in Italian.

I at first prepared a work, to oppose the results of the experiments of M. Rolando, to those obtained from the same experiments by M. Flourens ; with the intention of proving, that mutilations of parts of the cerebrum can never become a method of obtaining an acquaintance with the different functions of those parts. But more recently, M. Flourens himself has come to the conclusion, that he ought to substitute some other method of experimenting, for that of Rolando, which may explain to him the reason of the difference in their results.

I shall, therefore, first oppose M. Flourens' reasons and my own, to Messrs. Rolando and Coster ; we will

next ascertain, whether the improved method of M. Flourens actually produces more constant, or more conclusive results.

M. Rolando is first at issue with M. Fontana: "I was long acquainted with the experiments of the celebrated Fontana, from which it appears, that a tortoise, whose brain had been removed, continued to live for six months, and walked as before. In vain have I repeated the same, experiment; every time that I have removed the brain behind the cerebellum, the animal died suddenly, in the same manner as one whose head had been removed.

"I had occasion to converse with M. Fontana, and asked him the reason of this difference in result. He assured me, that he had always obtained the same results, even after having entirely emptied the cranium. I then repeated the same operation with the greatest care, and with very little loss of blood. Every time, that the medulla oblongata was deeply wounded, immediate death ensued; and, in the space of twenty-four or forty-eight hours, it was no longer possible for galvanism to excite the slightest sign of sensibility."

Let us hear Rolando's account of his own experiments: "I have made," says he, page 366, "innumerable experiments on kids, lambs, pigs, bucks, dogs, cats, and guinea-pigs, to observe the results of injuries to the tubercula quadrigemina and the parts adjoining the thalami optici; *but have rarely obtained constant results*; which is not surprising, when we reflect on the intimate interlacing of the numerous medullary filaments, which are met with in these parts; for, as it is extremely difficult to ascertain what filaments have been divided in these operations, we cannot draw clear and precise conclusions, where there is some difference in the results." This is precisely the argument, I have always used against this kind of researches.

The following is the opinion of Flourens in relation

to Rolando: "To obtain determinate and constant results," says he, page 317, "I have always been obliged to isolate the different cerebral organs from each other, with the greatest care; to lay these organs open entirely, to be able to follow and guide the instrument with the eye, to remove them only in regular symmetrical layers, so as never to go beyond the limits, which unite or separate them. All these precautions were indispensable, in order to obtain them before they were known; now that we know them, the absence of a single one will be sufficient to prevent our reproducing them. We can here tell Rolando, that in operating as he always has, that is to say, without isolating or uncovering them, without seeing or knowing how far he goes or where he stops, he surely never will produce them."

"Rolando has then never observed other than complex phenomena; he never has deduced from them other than vague or contradictory consequences; he has constantly confined himself to the repetition of the experiments of Haller, Lorry, and Ziun." By and by, I shall examine once more, if this isolation of the cerebral parts is practicable. In the mean time, let us confront the experiments of Rolando and Flourens.

### *Experiments on the Brain of the Mammifera.*

In the intention of observing what effects a current of galvanic fluid, directed from the brain to the different parts of the body, would produce, Rolando trephined the cranium of a hog; he then introduced into the hemispheres a conductor of a voltaic pile, taking care to touch sometimes one point, sometimes another, whilst the other thread was applied to the different parts of the body. Having repeated these experiments on different quadrupeds, he obtained only violent contractions, and noticed that they were

stronger when the metallic conductor penetrated the cerebellum.

M. Flourens, who does not believe, from his experiments, that the cerebral lobes, and the cerebellum, produce muscular contractions directly, presumes that the galvanic fluid is conducted to the immediate parts of contraction; that is to say, to the tubercles, the medulla oblongata, and medulla spinalis. Rolando believes, that the fibres of the hemispheres are destined to produce particular motions. M. Flourens says, that his experiments establish, that the hemispheres of the brain do not directly produce any motion.

The results obtained by Rolando were, that, whenever a large number of the fibres, which traverse the corpora striata, were cut or torn, the corpus callosum on the fornix were interested, a state of lethargy or stupor ensued; whenever the optic thalami were injured, sometimes tonic, sometimes clonic effects were produced, as catalepsy, convulsions. M. Flourens believes, that Rolando confounds here the effects of the lesion of the optic thalami, with those of the lesion of the tubercula quadrigemina, since, according to him, the lesion of the optic thalami does not produce convulsions. To the observation of Rolando, that the presence of food and a considerable noise do not induce the least motion in the kid, M. Flourens observes, that that is not astonishing, since, from his own experiments, the animal deprived of his cerebral lobes, neither hears, sees, nor smells, &c. Still, this same kid stands firm on his feet, and changes his position when seriously troubled. Can, according to M. Flourens, an animal still possess will, and sensation, without cerebral lobes? He again complains of Rolando, because he produces, sometimes stupor or lethargy, sometimes convulsions, according as he wounded at different times or all at once, the tubercula quadrigemina, the optic thalami, the corpus callosum, the fornix and its appendices. When Rolando, after having torn, sometimes the tubercula quadrigemina,



sometimes a portion of the optic thalami, attributes the irregularity of motion, or the apparent intoxication to the lesion of these parts, M. Flourens supposes, that the cerebellum has been wounded, without the knowledge of Rolando.

### *Experiments on the Brain of Birds.*

Rolando removed two thirds of the cerebral lobes of a hen, without wounding either the medullary expansion, which is found on the internal face of the hemispheres, or the oblong portion, which is observed near their base. The animal appeared to suffer a little at the commencement of the experiment; but, after twenty minutes, began to walk, drink, and eat; she was, notwithstanding this, a little giddy and apparently intoxicated.

Flourens says, that from his experiments it constantly appears, that the animal does not feel lesions of the cerebral lobes; and he does not believe, that the intoxication can be attributed to the lesion of the cerebral lobes; it is, however, difficult to maintain, that in this experiment Rolando has wounded any other parts than the lobes, as Flourens presumes; for the cerebellum is considerably behind the cerebral lobes.

Rolando removed in the same manner a large quantity of the substance of the hemispheres; he tore, not only the above mentioned medullary expansion, but also that which is placed at the base of the hemispheres. In proportion as he wounded the hemispheres more deeply, the animal became stupid, and remained more calm. She was not then quiet here, any more than at the commencement of the experiment. Finally, she became sleepy, and lay down for some time; an hour afterwards, she rose up and continued motionless on her feet. Neither noise, food, water, nor punctures, could induce her to make the least motion.

Still, on smartly kicking her, she moved a little. They penetrated the optic thalami, in each of which they made three or four incisions, which produced no result, except that the eyes remained open, and the pupils dilated, without its being possible to close them by touching them with any foreign body. Without taking any food of her own accord, the hen swallowed some crumbs of bread, that were placed in her throat. Rolando performed this experiment on pullets, falcons, ducks, and almost always with the same success. Having involuntarily touched in a raven, on whom he had performed the same experiment, the point situated above the annular protuberance, the crow was seized with frequent fits of hiccoughing convulsions, and expired in half an hour. Having slightly touched the adjacent parts of the annular protuberance, in many pullets, hiccoughs were *twice* produced, (not *always* it seems,) but they were always followed by convulsions and death.

M. Flourens here makes the remark, as I have mentioned before, that Rolando takes the tubercula quadrigemina for the optic thalami; and, that he has never been in doubt with respect to the real functions of the cerebral lobes, since he has never observed the loss of vision, hearing, nor that of the intellectual faculties, as a consequence of their ablation. However, at a very loud noise, the raven opened his eyes; he heard, although M. Flourens avows, that the lesion of the hemispheres was deep, which explains to him the stupor and complete lethargy. In this same experiment on the hen, Rolando made three or four incisions in the tubercula quadrigemina, without producing any new results, except the same stupor, the same lethargy. Why does not M. Flourens point out this circumstance, so contrary to his experiments, from which the lesion of the tubercles ought to produce convulsions? M. Rolando again deceives himself, when, in birds, he speaks of the annular protuberance; for, birds not having the lobes of the cerebellum, neither have they the annular protuberance.

*Experiments on the Brain of Reptiles and Fishes.*

M. Rolando removed the two hemispheres of the brain from a very large sea tortoise. Having replaced her in the water, she swam for some time, then went to the bottom and remained quiet for some hours, turning only sometimes on one side, and sometimes on the other. When she was pulled up with the string, she swam a little, and then sank to the bottom.

He removed the two hemispheres of the brain from the squalus catulus, L., and having replaced him in the water, he rapidly swam away, and concealed himself behind a stone, where he remained motionless, unless he was irritated. These experiments were repeated in a thousand forms on tortoises, and the result was always the same.

How can M. Flourens conceive in this case of the determinations of the will,—the precipitate flight, even enough of intelligence remaining for the fish to conceal himself behind a stone, and the sensibility reëxcited by the irritation? for, according to him, the hemispheres are the seat of the will, intelligence, and voluntary motions.

*Experiments on the Cerebellum in the Mammalia.*

Let us first see the origin of the pretended discoveries in the function of the cerebellum.

“The structure of the cerebellum,” says Rolando, “the important discoveries, made by the professor of Padua on the great number of laminæ of which it is composed, excited in me many suspicions of the true use of this organ. I believed that it was destined for locomotion.” To confirm this opinion he undertook the following experiment on the cerebellum; he removed by repeated cuts all that he could, from one

of the sides of the cerebellum of a hog and a sheep. But hardly did the lesion extend beyond the trephined side, than the animal was seized with hemiplegia, and he soon died in convulsive spasms and hemorrhage.

“It is demonstrated,” replies M. Flourens, “by my experiments, that the lesion of the cerebellum never produces convulsions; that, whenever these have been believed to have been produced by it, it has happened that the medulla oblongata has been wounded without its having been perceived.” All this is very well to say; but will Rolando acknowledge, that his procedure has not been exact?

The form of the voltaic pile can at most create the idea, that the cerebellum may be destined to produce commotions, but by no means locomotion. May there not rather be here, in this, some influence of the ancient theory in vogue, before and after the time of Willis, that the cerebellum secretes the vital spirits, the nervous fluid, the action of which on the muscles should produce motion? For many years the German physiologists have called the cerebellum, the organ of locomotion (*Sinn der räumlichen Bewegung.*) However it may be, M. Rolando has always been anticipated, and here, as on other occasions, he has discovered, that which he knew, or which he *à priori* presumed, as for instance blindness, after the lesion of the optic couches in the mammalia, &c.

He cut, in different directions, the cerebellum in one of these animals; after which the animal could no longer support himself on his legs, and appeared paralytic; in twenty-four hours he died in convulsions. Rolando says, that he has constantly observed, that the diminution of the motions was in direct ratio with the lesion of the cerebellum; this is the reason, why the animal was sometimes entirely paralytic, sometimes only on one side; at other times the exterior and posterior extremities alone remained motionless, according as the cerebellum was wholly or partially destroyed.



Flourens remarks, that if Rolando means to speak of the loss of motion by the loss of the cerebellum, his conclusion is entirely overturned by the facts. Thus we have always different results, always opposition between these two experiments !

*Experiment on the Cerebellum of Birds.*

Rolando removed nearly half of the right side of the cerebellum of a cock ; instantly the animal was struck with paralysis, and fell on the same side, without being able to use in any way the right leg, or perform the least motion with this leg. Finally, the paralysis extended to both sides. Rolando admits, nevertheless, that this cock sometimes moved his wings and lower extremities. To escape from this contradiction, Rolando attributes these motions either to the mobility of the muscular fibre solely, or to a small remnant of the cerebellum.

This loss of motion is contrary to M. Flourens, since he has shown, that all the motions remain after the ablation of the cerebellum. And to prove, that to this time the action of the cerebellum has been a mystery, he cites three observations of Sancerotte : from a lesion of the cerebellum there resulted a universal convulsion, a kind of shock combined with a trembling ; a dog kept constantly turning himself, rolling over, traversing the room, using his paws continually. A soldier, in whom after a fall a considerable collection was found in cutting into the cerebellum of the right side, kept constantly turning over in bed, and was in such continual agitation, that, when they attempted to replace him, he moved away and became stiff. A ball had passed through the left part of the cerebellum and penetrated to the posterior lobe of the hemisphere of the brain. During the forty-eight hours, that this soldier lived, his judgment was sometimes good, but oftener he was delirious ; he was always in agitation,

turning in his bed from one side to the other, and constantly moving his legs and arms. (See also vol. III.)

In all these cases, the cerebellum has been injured ; irregularity of motions ensued, and no paralysis.

*Experiments on the Cerebellum of Reptiles and Fishes.*

Rolando separated the cerebellum from the medulla oblongata in a tortoise ; he became paralyzed, and lived in this condition for ten or twelve days without making the least motion. Another tortoise lived two months, constantly sensible to the slightest touches, but so far immovable, that he could not stir from the place where he was troubled : the same thing occurred to a lizard and two serpents. Two fishes also lost the faculty of moving.

Rolando observed, that injuries made in the cerebellum, healed promptly, and then the pullets, tortoises, recovered their former faculty of motion. The first tortoise, in which he only tore and divided the cerebellum, remained paralytic for many hours ; but soon after it acquired a surprising faculty of motion and so great was this, that it stepped with a rapidity four times as great, as it was before accustomed to do. Rolando had the curiosity to examine the cerebellum, which was only covered with coagulated blood ; it appeared to him cicatrized and considerably increased in size. Could it be possible, adds he, that the cerebellum, having acquired by means of this cicatrix a greater development, can thus contribute to this unusual agility ?

Finally, Rolando gives us the promised explanation of the functions of the brain and cerebellum, and the morbid alterations the most difficult to understand, and all this by the assistance of the new structure of the brain, such as he has described it :

“In considering the hemispheres of the brain, as a mass of fibres, which first unite in bundles in their crura, then diverge and ramify to form the corpus callosum, fornix, corpora striata, optic couches, &c., we find the greatest analogy for maintaining, that these parts ought to enjoy an exquisite mobility, which being destroyed, increased, or augmented, enables us to explain the different morbid conditions, the seat of which has heretofore been believed to be in the cerebral mass, without its being imagined, that it was a true alteration of this organ.

Now, continues Rolando, is it not true that if, in tearing, bruising, or destroying the hemispheres, we produce heaviness, madness, stupor, whenever we observe a simular condition, in consequence of a morbid cause, as in lethargy or apoplexy, we ought necessarily to suppose, that the energy of the fibres of the hemispheres is more or less deeply altered? On the contrary, if the activity of the cerebral fibres is increased, we shall observe, that the operations, which are produced or modified by the cerebral organs, are also increased, as is observed in the different species of mania.”

Let this pass, although I by no means comprehend how any movement whatever can produce any other function, than that of communicating this motion to other parts. But let us follow the list of hypotheses.

“But how,” demands Rolando of himself, “can the cerebellum be the organ of motions which take place in muscles, in such a way, that, if it becomes altered, these motions become uncertain and vague, and that they cease entirely, when the organ is completely removed? I had at first suspected, that the corpora striata were destined for this object, but a more attentive examination of the structure of the hemispheres of the brain, and the resemblance of some of the apparatus of the torpedo, with the cerebellum of birds, convinced me, that this part of the brain was a

true electromotor, in which is secreted a fluid analogous to the galvanic fluid, which being then transported by the nerves which serve it as conductors, went to stimulate the muscles of locomotion."

"In fine, if an apparatus composed of different non-metallic substances, such as schistus, carbon, muscular flesh, cerebral substance; if the electrical organ of the torpedo, silurus, gymnotus, composed of a gelatino-cartilagino-albuminous substance, and other similar substances, is fit to prepare and develop a very large quantity of the electric fluid capable of giving violent shocks, why could not a similar principle, such as the nervous fluid, be formed by the numerous laminæ of the yellow and cineritious substance of the cerebellum? What can be found more evident to establish that the cerebellum is an organ, whose structure is precisely similar to the apparatus of Volta? What other proof can we desire, to demonstrate that the cerebellum prepares a fluid analagous to that which the Voltaic instrument developes? What more direct inference can be made, if we observe that all the influence of the nervous fluid on the muscles of locomotion ceases, if this organ is injured or destroyed? It appears to me, that no one has insisted upon the necessity of admitting a particular mechanism, by means of which the fluid prepared in the cerebral electromotor, can be transmitted to the central extremity of the nerve, that may be regarded as a conductor by which this fluid is enabled to pass, in order to irritate the muscles which are to be put in motion."

The hemispheres of the brain are then the principal seat of the proximate cause of sleep, insanity, stupor, apoplexy, melancholy, and madness. The diseases of the cerebellum, *medulla oblongata*, or of some nervous branches, will give rise to the different species of paralysis, whilst the cause of epilepsies and all spasmodic affections, is an irritation either produced at, or transmitted to, the origin of all the conductor nerves,



that is to say, from the medulla oblongata to the neighbouring parts.

Unfortunately for these ingenious explanations, M. Flourens denies, from his own experiments, that the cerebellum presides over motion; he only makes it the regulator of the motions; in the second place, is it really true that the cerebellum is an electromotor? The new discoveries in physics and chemistry always become the war-horse of the physiologists. I have already proved, that the cerebellum cannot be compared to the galvanic pile, or to a Voltaic apparatus. It is, like the hemispheres, a nervous and fibrous membrane, white on its internal surface, covered with a non-fibrous substance, of a grayish color externally. This membrane is not always folded in parallel layers, but in different directions. In consequence of this kind of folding, there is always between two pretended leaves, two layers of a non-fibrous substance, and these two layers are in immediate contact with the vascular membrane, which exists here, as in the anfractuositities of the convolutions of the hemispheres, in all the folds, or, to speak more correctly, which envelops and penetrates the whole surface of the non-fibrous substance of the cerebellum.

It is then with the explanations of the functions of the nervous system, and their application to the knowledge of morbid causes, as with the discoveries that Rolando has made on the new structure of the brain.

At the end of the experiments of the Turin professor, M. Coster has tried to prove, that the results obtained by M. Flourens, are similar to those obtained by Rolando. "I defy," says he, after having copied certain passages of Flourens, "the most subtle mind to find the least difference between the results announced in this passage, and those related by Rolando, except that the subject of the experiments of the one was a pullet, and that of the other, a pigeon." Where it is said in the report of the academy: "And cer-

tainly no one had suspected, that the cerebellum was in any way the regulator of the motions of progression of the animal." M. Coster replies; "I ask a thousand pardons of the academy; but this was one of the first things I learnt in commencing my medical studies. This discovery is so well known in the school of Turin, and in those of the island of Sardinia, that it is one of the principal subjects of discussion with the new students." M. Coster has manifested an extraordinary degree of gratitude, in reclaiming the property of his old professor from the encroachments of M. Flourens. "For fear," says he, "of being taxed with injustice and bad faith towards the French physiologist, whose works are later by thirteen years than those of Rolando, I will extract textually from the above mentioned work of Rolando the experiments that are there related, and I will place them parallel with the results of those of which the celebrated Cuvier has been the reporter. It will be seen, that these experiments and results have such an air of paternity, that it requires nothing less than the acknowledgd ability of the French experimenter, to induce us to believe, that it is not by chance, that he finds himself on the same track with the professor of Turin." As M. Flourens has preserved the same order, the same course in his researches, commencing by the brain of the mammalia, their cerebellum, and ending by the cerebellum of reptiles and fishes; as he speaks also of galvanism; as he terminates his work by researches on the action of nerves, precisely like Rolando; as I think I can perceive here and there symptoms of a similar hazard; and as it is not the part of sound philosophy to believe in chance, I conclude that for some years a new constellation reigns with an equal influence over our young experimenters.

The reader will recollect that in the third volume I have made some observations in opposition to the experiments of M. Flourens; it appears, according to M. Coster, that I at the same time attack the experi-

ments of Rolando, although I am myself ignorant of it; he believes it his duty to answer me.

1st. He wishes to prove that ablation is a good method of learning the special function of a single part of the brain. "If ablation," says he, "is not in all cases a necessary means of arriving at the knowledge of the special function of an organ, it must be admitted, that this method is at least one of the most certain in a great variety of circumstances. I suppose that a man, struck for the first time with the impression of light, is ignorant of the organ, the external instrument, by means of which this unusual impression is communicated to him; after having successively tried to deprive himself of the use of his ears, mouth, and nose, he comes to his eyes, closes them, and immediately he ceases to see; will he not then conclude, that the eyes are the instruments which transmit to him the impressions of light? Is not privation, or if you will, ablation, a sure means of judging of the special function of these organs? Let us apply this reasoning to the seat of perception of light. First we discover that it must be in the brain; but in what part? In order to know this, we successively cut away the superior thalami of the cerebral lobes, the animal continues to see; we destroy the tubercula quadrigemina, immediately the animal becomes blind; hence we conclude that the cerebral lobes are not the organ of vision, since it continues after they are destroyed; but the tubercula quadrigemina are so, and this is one of their special functions. It is then false to say that ablation is not a good method of ascertaining the special function of an organ."

The experiments of Rolando and Flourens have demonstrated, that so soon as the hemispheres are removed, the animal ceases to see and hear, although the eye, ear, and tubercula quadrigemina remain untouched. The hemispheres are then the organ of the two special functions, hearing and seeing!

Lastly, there exists a great difference between a

sense entirely isolated, and different cerebral parts so intimately connected with each other. And when I said that ablation did not make us acquainted with the special function of an organ, I spoke of the cerebral organs. I defy any one to discover any special function whatever by ablation, unless this function be previously known. There were many proofs that the hemispheres were the organ of the will and intelligence; that the *corpora quadrigemina* were a ganglion for the optic nerve; for a long time the nervous fluid for motion has been said to be secreted in the cerebellum. You have removed the pineal gland; what is its function? Take away the *corpora mamillaria*; the *infundibulum*, the *septum lucidum*, *fornix*, anterior commissure, &c. &c., and teach me their special functions! and again, in wounding a part, are you sufficiently skilled to limit this lesion exactly to this part? do you know the limits of a cerebral part which constitutes an organ? Why has the organ of vision so long been sought in the optic thalami? and why do Rolando, Rudolphi, &c. still find it there, even in the lesions and experiments by mutilations? &c. &c.

M. Coster continues: "Let us suppose," says Gall, "that M. Flourens wishes to verify by the ablation of the cerebellum, whether this part is or is not the organ of the instinct of propagation, how can he make the animal live sufficiently long, to be able to say whether he possesses or has lost the instinct?"

"If it is recollected that the experiments of Rolando demonstrate that tortoises live many months after the ablation of the brain and cerebellum, this time would seem to be sufficient to make the necessary observations on both these organs, and to become assured of the nature of their special functions."

After removing the hemispheres, the animal neither sees, hears, feels, nor has will nor intelligence, with what can he feel the instinct of generation? after having removed the cerebellum, the animal is either entirely paralyzed, or has only irregular motions, how



can he copulate? Lastly, show me an example of a similar act in an animal deprived of his cerebellum. Cause an animal to suffer in any manner whatever, deprive him of his liberty, take from him his accustomed food, and see how much difficulty you will have in making him desire to copulate. M. Coster does not admit as authority, the different results that myself and my friends have obtained. And as to myself, I have too much experience to confide in the decisions of commissions of the academy. It is hardly possible that academies, in constituting themselves judges of every novelty, can avoid committing themselves. As a proof, among others, see the report on our memoir, that in the contradictory experiments of Legallois, &c. &c. As another proof, M. Coster himself, who says, in opposition to M. Flourens and his reporter, that the cerebellum is neither the balance nor the regulator of the locomotive motions; that it is only the centre from which proceed the irritations that the conductor nerves transmit to the muscles; that the true regulator is the brain; and that the cerebellum influences the intensity of the motions, but not their regularity.

M. Coster again observes, that, if the cerebellum has no other special function, than that of exciting the venereal act, when this organ acts alone, the cerebral lobes being destroyed, it ought especially to determine the state of the genital organs, since, all things being equal, a cerebral organ performs its function as much more irresistibly as its action is less counterbalanced by that of other organs. This admirable reasoning induces me to think that, if at any time M. Coster should have need of a more energetic will and a more correct judgment, it will be necessary to remove his cerebellum, stomach, &c. Compare what I have said on this subject, vol. III, page 407-415, and it will be seen that M. Coster, in order to give a little plausibility to his cause, has been obliged to mutilate at least two thirds of my objections.

*Experimental Researches on the Properties and Functions of the Nervous System in Vertebrated Animals*, by P. FLOURENS, 1824.

It has been said in some journals, that the works of M. Flourens were but a repetition of those of Rolando, published in 1809. In order that this assertion may be tested, M. Flourens has first published, at page 273 and the following, a literal translation of the experiments of Rolando. We must now examine, if by this M. Flourens has succeeded in maintaining, not precisely his modifications, but the novelty and originality of his experiments and results. "I have not spoken" says he, "in the preamble of my memoir, of the work of Rolando, because it was entirely unknown to me. Under all circumstances, I should have had fewer motives for noticing him, as his work, in my opinion, does not add any precision to the results already obtained by the works of Haller, Lorry, Ziun, &c.

"Haller, Lorry, Ziun, Fontana, and twenty others ought necessarily to produce, in their experiments, all the phenomena that I have produced in mine, since the parts on which they experimented were the same as those on which I myself operated; but, 1st, they only perceived these phenomena in mass, and all the results of detail escaped them. 2d, even as to the results which they did obtain, they knew not to what organ to refer them, because they were never sure of the organ which they had wounded. 3d, by not insulating the organs, they of course could not insulate the phenomena. Thus they were never able to excite the one to the exclusion of the others. In a word, they had observed most of the phenomena, they had experimented on most of the organs, but they did not know to what organ in particular such or such determinate phenomena belonged; and this localization of phenomena by the localization of

the organs, was precisely the end that it was necessary to obtain."

The merit of M. Flourens would consist then in having localized both the organs and results. He admits six different divisions of the nervous system: the hemispheres, the cerebellum, the *corpora quadrigemina*, the *medulla oblongata* and the *medulla spinalis*. It seems to me, especially in animals, and more particularly so in the lower classes, that these parts are so far separated from each other, the cerebellum and the tubercula quadrigemina, the medulla oblongata and the medulla spinalis, so much concealed under the hemispheres, that the experiments must find a natural localization of the organs of M. Flourens, and that, consequently, most of their results at least should be equally localized.

After having found fault with the method of Rolando, M. Flourens denies his results whenever they differ from his own.

"In one of the experiments of Rolando," says he, "vacillation in the motions (*ivresse*) comes from the optic thalami, and the tubercula quadrigemina; in another it is derived from the cerebral hemispheres. In one the mutilation of the cerebral hemispheres produces heaviness and immobility; in the other it produces vacillation, that is to say, want of harmony, an ungovernable excitement of the motions; in one the animal is stupid and calm during the mutilation, and in another he seems to suffer; finally in one, neither noise, food, nor water excite the animal; in another, he drinks and eats. Thus, according to Rolando, the cerebral lobes sometimes produce stupor and sometimes excitement of the motions; sometimes the animal is stupid and calm; sometimes he suffers, and then he eats and drinks. Finally, it is sometimes the optic couches, sometimes the tubercula quadrigemina, sometimes the cerebral lobes, that produce these phenomena of excited action. Rolando then confounds all the phenomena, as he also confounds

all the organs from which these phenomena are derived, and that because his method does not separate the parts. With an isolated method he would have seen that stupor came from the cerebral lobes, excitation, from the tubercula quadrigemina, and irregular action, from the cerebellum."

This confusion of phenomena will constantly take place, as experience has demonstrated it, since physiologists have supposed that they could discover the functions of the nervous system, especially those of the cerebral parts, by means of mutilations. And I have proved, and I will again prove, that it is impossible to avoid this disorder by any method whatever. Rolando expressly says: "The hemispheres of the brain are then the principal seat of the proximate cause of sleep, idiocy, stupor, apoplexy, melancholy, and insanity. The diseases of the cerebellum, *medulla oblongata*, will give birth to the different species of paralysis, whilst the cause of epilepsy, &c., comes from an irritation produced or transmitted at the origin of all the conductor nerves, that is to say, at the *medulla oblongata*, &c." He has then insulated the organs and results.

"But," continues M. Flourens, "what is of peculiar importance to be remarked here, is that Rolando nowhere speaks expressly of the loss of the intellectual and sensitive faculties by the ablation of the cerebral lobes. He has even so little suspected this loss, that he says of a hen, whose cerebral lobes had been mutilated, that she ate and drank; and of a raven, according to him in the same condition, that at the sight of a dog or moor-hen, his deadly enemies, he no longer became enraged. Rolando has nowhere established this important fact, that all the intellectual and sensitive faculties reside exclusively in the cerebral lobes."

Rolando, according to Flourens, has done nothing but mutilate the parts on which he has operated; and according to the same M. Flourens, a very limited portion of the cerebral lobes is sufficient for the exer-



cise of their functions, page 310. Consequently his hen with mutilated lobes could yet eat and drink. But it is M. Flourens himself who is at fault, since at one time he makes the cerebral lobes the seat of the intellectual and sensitive faculties, and at another he makes a hen, from which he has entirely removed the cerebral lobes, eat, drink, and walk; qualities, according to his own declaration, intellectual and sensitive. I read with astonishment, at page 87, the martyrological biography of a fine and vigorous hen.

"This hen, deprived of her two lobes, lived ten entire months in the most perfect health, and she would have still been alive, if, at the time of my return to Paris, I had not been obliged to abandon her.

"During all this time, I did not lose sight of her for a single day; I spent many hours of every day in observing her; I studied all her habits; I followed her in all her actions, and noticed all her ways, and the following is an account of the observations which this long study has furnished me."

This important study of a hen deprived of all her intellectual and sensitive faculties!!

"As soon as the two cerebral lobes were removed, the sight of both eyes was lost. The animal no longer heard, nor manifested any sign of volition: but she kept herself perfectly balanced on her legs, and walked when irritated or pushed; when thrown in the air she flew, and swallowed water when it was put in her beak."

Believe this, my kind reader; to stand erect, walk, fly, swallow, are no evidences of volition!

"In other respects she stirred not, unless irritated. When placed on her feet, she remained on them; when laid on her breast, like hens when sleeping or resting, she continued in this position; she was constantly plunged in a sort of lethargy, affected neither by noise nor light, but from which she could only be aroused by immediate irritations, such as pinching, blows, pricking, &c."

Pricking, pinching, blows have produced determinations in an animal, without their being perceived! This is a little too much even for Baron Cuvier.

"Six hours after the operation, the hen assumes the attitude of profound sleep; that is to say, she turns back her neck, and conceals her head under the feathers of the upper border of her wing, as animals of this species do when sleeping.

"I left her for nearly a half quarter of an hour in this state; I then briskly irritated her; she suddenly started from her sleep; but hardly was she awake, when she again relapsed into a deep sleep."

All this proves to M. Flourens, that the seat of the intellectual and sensitive faculties is in the cerebral lobes!

"Eleven hours after the operation, I caused the hen to eat by opening her beak and thrusting in food, which she swallowed very well.

"The next day she aroused a little from the sleep in which she was plunged, and in doing this she exhibited the manners of a hen awaking.

"She shook her head, moved her feathers, sometimes even cleansed them with her beak, and sometimes changed the foot on which she stood; for often she slept resting on one alone, as birds generally sleep."

Proofs still more evident that the hen has neither instinct, intelligence, will, nor sensation!

"In all these cases, we should say that a man was asleep, who without entirely awaking, and still half asleep, changes his position, takes another as a relief from the fatigue occasioned by the former, takes a more easy one, often stretches himself, straightens out his limbs, gapes, shakes himself a little, goes to sleep again, or remains thus drowsy."

Thus a man half awake is a man completely deprived of will, memory, sensation, &c!

"The third day, the hen is no longer as quiet as usual. She goes and comes, but without motive or end; and if she meets an obstacle on the way, she

knows neither to avoid it, nor turn from it. Her comb and gills are red as fire, the skin burning; she is seized with acute fever. I gave her water in abundance.

“In other respects, no sign of convulsion, no want of harmony in the motions appears; and two days after this there is no more agitation or fever; the hen becomes calm and drowsy as usual.

“I pass over many articles of my journal, and come at once to the second month of the operation.

“The hen enjoys perfect health; as I feed her with great care, she has become very fat. She sleeps a good deal, and when she is not entirely asleep, she is drowsy.

“For many days long fragments of the cranium, exposed to the air, have exfoliated and fallen off. The cicatrix is rapidly forming.

“Five months after the operation, I never saw a fatter or fresher hen than this one. The wound of the cranium; is entirely cicatrized a fine, white, and smooth skin covers the whole of its surface; and below this skin a new long layer is formed, which, although as yet very delicate, is however very solid.

“I have kept this hen from feeding, on different occasions, for three whole days; then I have put food under her nostrils; have plunged her beak in grain; have placed grain in the end of her beak; have dipped it in water; have placed her on a heap of corn: she has neither smelt, swallowed, nor drank; she remained immovable on the heap of corn, and would most assuredly have died there of hunger, if I had not fed her by putting the food in her throat.

“Twenty times, instead of grain, I have put small flint stones into the bottom of her beak; she swallowed them as she would have swallowed grain.

“Finally, when this hen met with an obstacle in her path, she fell against it, and the blow arrested and stopped her; but to fall against a body is not to perceive it by the touch. Never did the hen feel, grope,

or hesitate in her step; she meets with obstructions, and falls against objects, but she touches nothing.

“Thus then the hen without lobes has really lost her sense of taste, touch, and smell, with vision and hearing. Yet none of these senses, or, to speak more correctly, no organ of these senses has been directly affected. The eye is perfectly clear, and the iris movable. Neither the organ of hearing, taste, nor touch has been injured. A remarkable circumstance! There is no longer sensation, although the organs of the senses exist. It is not then in these organs, that sensation resides.

“Finally, the hen without lobes has lost all her senses, for she neither sees, hears, smells, tastes, nor touches any thing.

“She has lost all her instincts, for she no longer eats of her own accord, however long she has been fasting; she moves not, however much she is incommoded; she never defends herself against other hens; she knows neither to fly nor to fight; she has no more desires for coition; the caresses of the male are either indifferent to her or unperceived by her.

“She has lost all intelligence, for she neither wishes, remembers, nor determines upon any thing.

“The cerebral lobes are then the sole receptacle of the sensations, instincts, and intelligence.”

We have now come to a conclusion, which should astonish all physiologists by its novelty.

Here terminates the precious narrative of the life of our heroine. When M. Flourens and his reporter shall have demonstrated to me, that to stand erect, to walk, to decide in consequence of extraordinary irritations, to fly, swallow, turn back the neck, conceal the head under the wing, shake it, put the feathers in motion, sharpen and clean them with the beak, alternately change the feet to rest them, stretch out and straighten, shake and resume the equilibrium, raise up and resist the efforts that are made to open the beak, as the pigeon did, whose two lobes were equally mutilated,



page 32, &c., are the undeniable proofs of the absence of sensation and volition, &c., I will admit the conclusions of M. Flourens.

Some weeks since, I found in my garden a tame jack-daw ; he was easily caught ; surrounded by sparrows and hens he continued perfectly quiet. I carried him to my apartment, and ascertained that his thigh was broken. I placed him in a cage ; he remained perfectly still, neither ate, drank nor flew ; I thrust food to the bottom of his beak, he rejected it ; two days afterwards he swallowed, after this he ate, drank, and became wild, and flew away. He now returns every day, with the leg hanging, to seek food. I only mean to say by this, that it takes much less than the ablation of the cerebral lobes, to suspend, while the animal suffers, the exercise of his faculties.

As the hen of M. Flourens evidently manifested sensation and volition without cerebral lobes, Rolando, at least, has not established a hazardous conclusion. He speaks often of drowsiness and stupor, which is nearly equivalent to the loss of the intellectual and sensitive faculties. And if Rolando has not expressly said, that all the intellectual and sensitive faculties reside in the cerebral lobes exclusively, M. Coster his pupil has supplied the omission. Before the publication of the experimental researches, 1824, and before this reproach of M. Flourens, M. Coster had already said, *Archives Generales de Medicine*, March 1823, page 376 : "The experiment that I have just mentioned, led M. Rolando to deduce very simple consequences, which will occur of themselves to the mind of the reader. In fact if the lesion, compression, destruction, or ablation of the hemispheres of the brain is constantly followed by an alteration or a complete deprivation of the intellectual functions, we are forced to conclude, that the hemispheres are the organ which presides over the functions, and that when they are interrupted by a morbid cause, it is in the hemispheres, that we must look for the seat of those alterations, which produce similar effects."

Finally, what is there new in the conclusion of M. Flourens, since my works? and as to the results obtained in a frog and hen, &c., are they applicable to man?

M. Flourens promises to show us by and by, by his new experiments, that a very limited portion of the cerebral lobes is sufficient for the exercise of their functions. It is then true, as the German philosopher, that I have already cited, says, that the brain of a frog might very well be the seat of the mind of a Newton. After this, what will become of the comparative anatomy and physiology of the brain? Ah! how much superfluous expense does nature give herself, to bestow a little more intelligence on the monkey than on the tortoise, and a little more on man than on the monkey!

M. Flourens says: "What was most difficult and which has cost me the most pains to distinguish in the phenomena of the cerebellum, was the principle of coördination entirely different from the principle producing the motions, and of which, I dare believe with Baron Cuvier, that as yet no physiological idea is entertained."

No doubt that physiology will soon be encumbered with incomprehensible ideas. To this very time physiologists have believed, that they could admit a difference between the organ that perceives, and the organ which receives the impression, between the organ which commands, directs, rules, and the organ that executes. But, it is neither the cerebellum, nor the *medulla oblongata*, nor *spinalis* which produces motions. The nervous system is the source, the indispensable condition of the motions that are executed by other instruments. Without volition, sensation, intention, no united or coördinate movement can take place. It is then contrary to reason, to look for the regulator or balancer of the motions in any other place, than that where perception takes place, where the seat of volition exists. Can we be astonished that this coördinating principle has cost M. Flourens so much labor? Since this principle exists not in facts, it was requisite that the experimenter should distil it from his brain.

"To resume, there is nothing in Rolando's work," says M. Flourens, "of the direct loss of vision and hearing by the loss of the cerebral lobes."

The loss of audition and vision or rather the loss of the perception of light and sound, is effected in the same manner by the ablation of the cerebral lobes, as the loss of every other faculty belonging to the two hemispheres of the brain. When Rolando mentions stupidity, heaviness, it may well appear to him superfluous to specify the loss of vision and audition; and when in the morbid affections of the cerebellum, the functions of sight and hearing are changed or lost, is it the cerebellum also which is the seat of them?

"Nothing is said of the *croisement* of the loss of vision by the loss of these two organs."

I hope M. Flourens will not attribute to himself the discovery of this *croisement*.

"Nothing is said respecting the preservation of all the intellectual and sensitive faculties, by the preservation of a single cerebral lobe."

See my works, volume II. page 234, octavo edition.

"Nothing is said of the regulating principle of the movements of locomotion and prehension, the seat of which is the cerebellum."

Novelties coincide with extravagancies; when I write a history of the vagaries of the human mind, the cerebellum, the regulator and balancer of motion in company with a very limited portion of the brain to perform all its functions, shall hold one of the principal places.

"Nothing is said of the formal independence of the locomotive and sensitive faculties."

This is not so, for Rolando has very well, and in many places, observed this difference. An idea, too, which is ancient and very generally admitted.

"Nothing, finally, is said touching the precise limit which separates the nervous parts, susceptible of exciting muscular contraction, for those which are not susceptible."

M. Flourens has been already told, that there was nothing new in all this.

After censuring the experiments of Rolando, M. Flourens lays down the following propositions:

"1st. There are in the nervous centres, distinct organs for sensation and motion, and consequently the property or faculty of sensation is essentially distinct from that of motion."

As M. Flourens has only the cerebral lobes, the cerebellum and the *medulla oblongata*, in view here, what will he do afterwards, with the anterior and posterior nerves of the spinal marrow?

"2d. The *medulla spinalis*, *oblongata*, tubercula quadrigemina, are alone susceptible of exciting *immediately* muscular contraction; the cerebral lobes and cerebellum are not susceptible of it."

Unless M. Flourens has recourse to the distinction of *mediate* and *immediate* influence, a thousand pathological facts of symptoms produced by the lesions of the brain and cerebellum, will disprove his assertion.

"3d. Sensations, instincts, and volitions reside exclusively in the cerebral lobes; as also all the intellectual and sensitive faculties."

Read my work, vol. II. page 153 and the following, where you will at the same time find, page 67, 69, &c., discussions on the question, viz: the functions that are usually attributed to the mind or brain; and whether we may consider the brain as the organ of all the operations of animal life? and page 69, the reasons which seem to prove, that the brain is the organ of all the sensations and all the voluntary motions. But, as if I had foreseen that the day would come, when M. Flourens would cut away from a rabbit all the cerebral parts, with the exception of the *medulla oblongata*, and that this animal would not only breathe still, but that being strongly pinched, he would be troubled and cry out, page 183; that consequently there would yet remain sensation and volition; as if



I had anticipated all this, I say, I have added other reasons, page 85, which seem to prove, that other nervous systems, entirely independent of the brain, may also produce sensations and voluntary motions. I have even established this idea on the existence of animals in whom we cannot deny voluntary motions, the senses of touch and taste, although we cannot discover any thing in them which can be compared with the brain. These animals experience hunger, seize their prey, eat; and since they have no brain, these sensations must in them have their seat in other nerves. Add to this, that every nerve destined to any particular function whatever, has, as well as the brain itself, its particular origin, its particular apparatus of supply, its final ramification, and forms even in itself a particular organ. Why should not a similar nerve thus form a whole relative to its destination? why should it not embrace a sphere of activity which should be peculiar to it? —and many similar reasons; which weaken and greatly limit the pretended exclusive property of the brain. I again ask, in this rabbit deprived of brain, cerebellum, and tubercula quadrigemina, and in those monsters that are born without brain or cerebellum, which cry and suck, what organ has determined the will to cry and suck, and what organ has rendered the motions requisite for sucking and crying, coördinate? Ought we not finally become more circumspect before we establish laws or principles?

“4th. The coördinate principle of the movements of locomotion and prehension, resides exclusively in the cerebellum.”

This is in contradiction to the preceding propositions; for the coördinate principle is inseparable from that of sensation and volition, properties of the cerebral lobes alone, according to Flourens.

“5th. As the loss of the cerebral lobes does not in the least change the regularity nor order of the motions, so the loss of the cerebellum does not in the

least degree, alter the regularity or the energy of the sensations. The centre of the sensations is then essentially distinct from the centre of movement, and the sensitive faculties, from the locomotive faculties."

Stupidity, heaviness, the loss of sensation, volition, &c., will they not then in the least change the regularity nor the order of the motions?

"6th. In voluntary motion, it is necessary to distinguish the action of the nerve, that of the spinal marrow, the cerebellum, and that of the cerebral lobes. The nerve excites immediately muscular contraction; the spinal marrow connects the different contractions in united motions; the cerebellum coördinates these movements, and renders them determinate: walking, flying, standing, &c.; the cerebral lobes perceive and will."

To will and perceive are absolutely the first condition of all united and coördinate movement. How then can we believe in like motions, when the cerebral lobes do not exist, when they have been violently removed, and when they are alone the seat of will and sensation?

"7th. The loss of a single cerebral lobe only induces the loss of vision of the opposite eye; all the other intellectual and sensitive faculties remain."

The *intellectual* faculties, that the hen with one cerebral lobe manifests! As to man, I have already indicated the page of my work where this idea may be found developed, in a manner much more rational and practical.

"8th. The loss of one of the tubercula quadrigemina, also, occasions the loss of sight of the opposite eye."

Read again my large work, vol. I. page 112, on the optic nerve, and my answer to the report of the French Institute, page 101, &c., you will there find this anatomical fact very circumstantially announced.

"9th. The loss of both cerebral lobes renders the animal blind; neither the iris, nor retina, nor optic nerve, are changed by this loss."

What then : the loss of the two cerebral lobes deprives the animal of the perception of every impression whatever. Why then, only of the perception of the impressions of light ?

“ On the contrary, the loss of the tubercula quadrigemina, when it is complete, instantly paralyzes the iris, retina, and optic nerve.”

A result certainly easy to find, since we have demonstrated, that the optic nerve takes its first visible origin from the corpora quadrigemina. It is very possible, that hereafter, when experimenters shall know the different origins of the optic nerve, that they will not find complete blindness instantly occurring on the destruction of the corpora quadrigemina.

“ The origin of the sense of sight is then distinct in the cerebral mass, from the seat of the sensation of vision. The origin of the sense resides in the corpora quadrigemina ; the principle of the sensation, in the cerebral lobes.”

M. Flourens, apparently the better to impress his readers, says often, as here, with much pretension, what no one is ignorant of, for instance, the distinction between the sense and the perception of impressions upon the senses.

“ 10th. Each of the other senses, smelling, tasting, hearing, has equally, in the cerebral mass, an origin distinct from the centre, or sole receptacle of the sensations. There are then in the cerebral mass, distinct organs for the senses, sensations, and motions.”

Why so many evasions ? Why has M. Flourens, a few lines back, stopped so complacently at the sense of vision ? and why does he admit in the cerebral lobes, the senses of tasting, hearing, and seeing, which anatomy points out to us in another place, since it suffices that the lobes are the organ of all perception ? When these lobes are removed, there is no longer a perception of the natural wants, neither hunger nor thirst, &c., and hunger, thirst, and the natural wants, should they also have their seat in the cerebral mass ?

“11th. When the cerebellum is entirely removed from an animal, all the regulated movements of locomotion and prehension are at once lost ; but all the regulated motions of conservation (respiration and circulation) remain. The movements of locomotion are then essentially distinct from the motions of conservation.”

“Every part essentially distinct from the nervous centres, has then an office to perform, peculiar functions, distinct and specific properties.”

The whole of my treatise on the plurality of organs for the different instincts, propensities, intellectual faculties, essentially different, is based on this principle.

“This office, these functions, these properties now being known, every one hereafter will see the facility that pathology will have, in inferring an alteration of parts from an alteration of properties, and reciprocally a lesion of properties from an injury of parts ; a double decision which is the end and perfection of all pathology.”

This would be an excellent method of diagnosis, if in nature, and diseases, all the phenomena occurred in an isolated manner. But the practitioner will never forget that, throughout the system, the organs are held together, reciprocally influence each other, and easily produce a confusion of intricate causes and effects, &c. &c. Here again M. Flourens has followed Rolando, and this last, the medical doctrine of all ages.

Definitively, then, the results and the explanations of the experiments of Rolando and Flourens, are, in many respects, opposed to each other, as it has heretofore happened to all experimenters by lesion and mutilation ; as it must necessarily always happen ; and as it has always happened, it also happens to our two estimable associates, that always, sooner or later, we find the promises of experimenters by lesion and mutilation, evaporated almost to zero.

Let us now leave the society of Messrs. Flourens



and Rolando, and see what remains to be said on the ulterior experiments of M. Flourens. I will not repeat here what I have already said in the third volume of this work, on this subject.

M. Flourens begins by explaining to us why, before him, all experimenters, as I have just said, obtained only complex phenomena, and vague and uncertain conclusions. They always experimented on many parts of the nervous system together, and they never properly isolated the other parts from that which was experimented upon, or they only experimented on certain parts of the nervous system, and then attributed to the whole of this system, effects, which almost always, belonged only to the parts experimented upon ; they then always confounded the results, given by one of these methods, with those afforded by the other.

In order to escape these shoals, he has successively experimented separately on the nerves, the spinal marrow, the brain, and the different parts of the brain. In operating on each of these parts, he says he has taken the greatest and most scrupulous care not to interfere with other parts, and thus to avoid all foreign complication.

There is no doubt, but that this is one of the causes why the experiments by mutilation and lesion, have been up to the present time so contradictory, in the hands of different experimenters, and why the results have always been either barren, or at least vague, uncertain, accidental, &c. There is also no doubt but that the method of M. Flourens would be infinitely preferable to that of his predecessors, if the execution of it were practicable. When we read of the experiments of our physiologists on the brain, we are almost induced to believe, that the whole nervous system, especially the brain, cerebellum, &c., are only composed of pieces of wax applied one over the other. One is removed, and another is removed, and the loss of one or another function instantly takes place. No one thinks of the state of suffering, trouble, and uneasiness

of the animal, of the blood that inundates the injured parts, and which it is necessary to stanch at every instant, which very often immediately coagulates, and it requires such compression, friction, and searing, that the part operated on rarely presents a smooth and clean surface, to enable us to ascertain with exactness how deep and to what extent the lesion or extirpation has been practised. They always assure us that the experiments have been a thousand times repeated; but, with a few exceptions, it is hardly possible to perform twice, absolutely the same operation, which explains why every time, unless the experimenter wishes to impose upon us, the accidents attending the operation vary; which also brings about a variation in the results. This single circumstance is generally sufficient to disgust, with this sort of experiments, all those who seek new truths with candor, without self-love, without the incitements of a fugitive vanity. M. Flourens assures us that, in order not to confound the parts on which he has operated, and not to attribute a result to another organ than that to which it belonged, he has by turns experimented separately on the nerves, spinal marrow, brain, the different parts of the brain, and that, in the exploration of each of these parts, he has taken the most scrupulous pains to interest that part only on which he was experimenting, and by this means to avoid all foreign complication. He adds, that it is always necessary to be as careful as possible of those parts which furnish blood; 1st. Because the loss of blood greatly abridges the life of the animal, and it is quite necessary that the animal should live to furnish the results of the experiment; 2d. Because the blood being effused in the cerebral mass, produces those compressions, the results of which being confounded with those of the experiments, complicate and often even destroy them.

I conclude from this that M. Flourens knew perhaps better than his predecessors, with what precautions similar experiments ought to be performed.

But is it not to be feared, that by this he has in a great measure pronounced his own condemnation? Is this localization of the cerebral parts and their results possible? Where is the anatomist or physiologist, who knows with precision all the origin, the extent, the ramifications, and connexions of an organ? You remove the cerebellum, at the same instant you wound very seriously the medulla oblongata and spinalis, the annular protuberance, the tubercula quadrigemina; consequently your results belong not only to all these parts, but also to all those, that communicate with these mediately and immediately. You believe that you have isolated the tubercula, but these tubercula have connexions with the corpus olivare, the medulla oblongata, the cerebellum, with the sense of vision, and with many convolutions; the optic thalami, and the corpora striata, are connected below with the crura of the hemispheres to the annular protuberance, the medulla oblongata, the pyramids and spinal marrow; above, with all the cerebral membrane, all the convolutions, the grayish non-fibrous substance; by their surface to the different commissures, such as the anterior commissure, the great commissure or corpus callosum; to the fornix or *septum lucidum*. Thus there does not exist a cerebral part, of which we do not know that it has very multiplied relations with other parts. I do not even except the corpora mamillaria, the pineal gland, infundibulum, &c.

And surely the connexions that are unknown to us, are still more numerous. This being established, how can we present the reciprocal influence of all these parts, especially when they are irritated, injured, lacerated, or removed? And how can we isolate their results? This beautiful idea of localization is then only a fine and presumptuous chimera.

To arrive at a cerebral part, we must perforate, break or cut the bony parts; we must wound and tear violently, the different membranes which envelope the nervous system, and which establish, among all its

parts, an intimate connexion by means of the vascular and arachnoid membranes. And as these membranes penetrate not only the ventricles and the convolutions, but also the whole cerebral mass, the loss of blood, their irritation, inflammation, &c., must inevitably complicate the experiment and its results.

M. Flourens frequently makes horizontal sections of the cerebral parts; this procedure would imply that the organs on the different parts of the brain, are composed of horizontal layers placed one upon another. This disposition does no where occur, not even in the annular protuberances. Upon the anterior pair of the tubercles, on the surface of the brain and cerebellum, &c., you can remove a very delicate layer of non-fibrous substance; but this substance already contains the early rudiments of an infinite number of nervous filaments, which are continued into the interior of the cerebral masses. Throughout, the white filaments of the cerebellum, brain, corpora striata, optic thalami, crura of the brain, annular protuberance, and tubercula course and diverge from below upwards; throughout, they plunge either diagonally, perpendicularly, or obliquely towards their apparatus of supply; and from thence to their ramifications. The converging fibrils in inverse order arrive from the surface of the brain and cerebellum to form the different commissures. Thus this art, so much recommended and extolled, of removing the organs by layers, is in opposition to the structure of the cerebral parts.

They talk to us of the medulla oblongata, the annular protuberance, as cerebral parts that it would be easy to isolate: not more than the tubercular quadrigemina. These are still a part, the continuation of the bundles of the medulla oblongata and medulla spinalis. They are at the same time formed by ganglions, one part of which gives origin to the fibrillæ of the optic nerve. So in a great degree, is the medulla oblongata a continuation of the medulla spinalis, besides that it contains many masses of non-fibrous sub-



stances, which, like so many ganglions, are the origin of many nerves of the greatest importance, and which belong to very different functions. The annular protuberance is not alone composed of the nervous bundles of the two hemispheres of the cerebellum, or the commissure of the cerebellum, it is also the continuation of many bundles of the medulla oblongata and spinalis, the anterior and posterior, or inferior and superior, pyramids, and it contains a considerable quantity of non-fibrous substance, placed between the transverse and longitudinal bundles, and which create new filaments for the crura of the brain, the tubercles, &c. We see, then, throughout the brain, the parts very materially complicated, which renders any localization absolutely impossible. This localization only becomes practicable where the particular nerves are already disengaged from the common masses, in order to join the apparatus where the special function takes place. This is applicable to all the nerves which take their origin from the medulla oblongata, &c. &c. More than this, you cannot isolate or localize the nerves of the senses, before they are complete and joined to the apparatus of the sense. The origin of the nerves of taste is confounded with the masses of origin of many other nerves; the auditory nerve is confounded with the nervous and non-fibrous masses of the fourth ventricle; the optic nerves, at first, with all the mass of the tubercles, with the corpora geniculata and their contiguous parts, with the crura of the brain, and with the grayish layer situated immediately behind their junction. The olfactory nerves are at first intimately united with the gray substance placed on the interior and inferior convolutions of the middle lobes, with the anterior cerebral cavities, &c.

Either those who experiment on the brain, and the cerebral parts, have never had a clear and just idea of the organization of the nervous system, or they impudently calculate to make dupes; and they succeed marvellously, since, in spite of the refined precision of

their precepts, they find their readers and judges in a greater ignorance than that in which they themselves are, of the most essential facts of the cerebral organization. See further, my treatise, volume III. page 155, &c., on the mutilations of the brain, as a pretended means of determining the functions of its different parts.

M. Flourens has generally chosen young animals for his experiments on the cerebral mass and spinal marrow. He gives many reasons for this choice. "First," says he, "the bones of young animals being very tender, we experience less difficulty in removing them; in the second place, it is invariably the case, that the younger an animal is, the less he resists mutilations. Finally, and this applies particularly to experiments on the cerebral mass, the sinuses of the dura-mater being comparatively very little developed in the early ages, we have less fear of being embarrassed with blood."

In no experiments on the cerebral mass can we avoid opening the cranium, and incising the membranes. Hence there will always be an effusion of blood. The sanguineous vessels are even more gorged with blood in young animals, for this is the most important and active period for formation and nutrition. The whole cerebral substance is much redder, much more sensibly penetrated with sanguineous vessels at this age, than later. Besides, at this period, the organization of the brain is not yet completed. The non-fibrous substance is still predominant; the whole substance of the cerebellum and brain is yet soft, a kind of gelatinous pulp, much more liable to be crushed or torn. How can any one pretend to judge of alterations of functions, which a little while after birth do not exist, and whose manifestation we cannot expect, until the successive development and maturity of the organs?

Another consideration renders the choice of young animals still more objectionable. The organs of ani-

mal life not being yet formed, they are still under the dominion of vegetative life. Many lesions and mutilations do not produce the same effects, which they produce in an older animal. To mention one example even respecting the functions of preservation, we have much greater difficulty in destroying new-born cats and dogs under water, than the same animals some months old, because the circulation and respiration are performed partly in consequence of other laws. It is then always a very uncertain thing to apply to an adult animal, what may have been very well observed in a very young animal. This application is not even practicable at any age, when we choose for the subjects of our experiments, animals of a very inferior order. First, many cerebral organs, with which animals of a superior order are endowed, are wanting in them. Every thing is much more simple, much less complicated, and if in consequence of this, even we obtain more simple results, we can never with the least probability, believe them equivalent to those that a similar experiment would produce, in a much more complicated organization, where the results manifest a complication of the reciprocal influence of many organs.

It must, however, be remarked, that my objections or observations against the lesions and mutilations, are particularly directed against those who, by this means, wish to learn the animal functions of the cerebellum and brain. I understand by animal functions, the mechanical aptitudes, instincts, propensities and intellectual faculties; but, so far as these are concerned, all the experimenters are yet at an enormous distance. Almost always, they confine themselves, as Haller, Ziun, Lorry, Lancerotte, Rolando, Flourens, &c. did, to an exploration of the nature and the relations of the phenomena of irritability, excitability, motion, whether spontaneous or voluntary, and sensibility. To this end, we ought to accord to them, especially M. Flourens, the merit of having devised very ingenious

and sometimes conclusive experiments. But he confines himself, so far as sensibility is concerned, like the philosophers, to generalities which are really very nearly the same in reptiles, fishes, birds, the mammalia, and man. All are excitable, all have sensibility, all have also volition; and if to eat, drink, walk, fly, leap, crawl, swim, can be included under the empire of the intellectual faculties, they all possess intelligence. Thus, it is in these points of view solely, that true and constant results, obtained from experiments performed with address and discernment, on young and inferior animals, merit our attention.

But so soon as we desire information on the mechanical aptitudes, the different propensities, instincts, and intellectual faculties, experimenters leave us in an absolute desert. It is as if these faculties and qualities did not exist, or that there does not exist any relation between them and the nervous system. They never make mention of an instinct, propensity, or determinate talent. It is known that animals have the propensity for propagation, that they love and take care of their young, that they travel, build, sing, lay up provisions, recollect places, things, and persons; that they unite together for life, &c., but all this is nothing according to the experimenters, but sensibility, or at most, modified intelligence. That such an animal is of a mild disposition, and another, savage; that such an one delights to live on the peaks of mountains, whilst another never leaves the valleys; that some construct and others do not; that some unite in marriage and others do not; that some live in society and others remain isolated; all this is not worth the trouble of searching out the cause in the animal organization, it is all explained by the unity of the brain, and, if we hesitate ever so little, even without a brain. Very well! gentlemen physiological experimenters, clear up to us a single one of these points. Before my discoveries, you did not think of this; now the materials are in your hands.



Cut, pinch, prick, remove, cause your martyred animals to live as long as you will, and show us which of those faculties continues or ceases to manifest itself! You cannot deny the existence of these qualities and faculties, since all the actions of man and animals attest them, or prove to us that it belongs only to their volition, to the direction of what you call intelligence, that the tiger has the propensities of the tiger, the sheep those of the sheep; that the male nightingale sings, and that the female and so many other species of birds do not sing; that such a man, in spite of all obstacles, excels in poetry, in a spirit for observation, in a talent for music, and that another, with all the faculties, all external encouragements, never rises above mediocrity, &c.; that such a species of animals is continually on the round of gradual perfection; that such an instinct appears and disappears at such an age, such a season; where will you show us the material conditions of these phenomena at the point of your scalpel! None of you thus far have had either the philosophy or the courage, to meet these questions; otherwise you would have soon been convinced of the insufficiency and nullity of your cruel experiments.

Let us return to M. Flourens, page 20; he says in a note: "The corpora striata are wanting in reptiles, and the optic thalami in fishes; but they all possess the tubercula quadrigemina, and consequently vision."

Thus whenever animals have a common organ, they have also the common function. If certain apparatus are wanting in reptiles and fishes, it follows that certain functions are also wanting. It is not then true that animals have all the same cerebral parts, and that they all have the same parts as man. The different parts are then destined to different functions. As this difference of composition does not only exist in different species of animals, so far as the cerebellum, brain, medulla oblongata and spinalis, corpora quadrigemina are concerned, but also for the greater or less

complicated composition of the cerebral lobes, it necessarily results, that the different parts of these lobes are destined for different functions. A singular thing this! They prove the existence of one organ for muscular contractility; another for excitation; another for the connexion of partial contractions into uniform motions, and another for volition and sensation. They wish even by carefully slicing the cerebellum, to be able to destroy the faculty of flying, or flying and walking, or at the same time flying, walking, and standing, page 40. And yet they manifest an hypocritical aversion for the plurality of the organs of the qualities and faculties of the mind, so essentially different!

I can observe to M. Flourens, that the corpora striata are never wanting in reptiles, and that it is not true, as he says, that the volume of the tubercula quadrigemina is, in all species of animals, in direct proportion with the volume of the optic nerves and the eyes.

The mole has the tubercles very large and the optic nerves and eyes very small. This proposition would be true, if the whole nervous mass of the tubercles was destined to produce the optic nerve; but the greatest part of these tubercles belong still to the continuation downwards, of the spinal marrow, and upwards to the other cerebral parts; on this account it is, that irritating them produces muscular contractions, when it extends to a certain depth. Touch only the surface of the anterior part, and no effect of irritation will ensue. Touch the bulb of the olfactory nerve, the gray band on the sides of the fourth ventricle, or the ganglion of the auditory nerve, but do not push the instrument so far as the corpus restiforme; and you will have neither contraction nor convulsion.

Our celebrated experimenter maintains, that all the parts capable of exciting contraction, have the gray substance within, and the white substance without; that an inverse disposition of these two substances

constitutes the character of the non-exciting parts, that is to say, of the cerebral lobes and the cerebellum; that we can then judge, *a priori*, of the properties of these parts by their structure, and reciprocally of their structure by their properties.

All this proves that M. Flourens does not yet understand the true use of the two cerebral substances. There is throughout, where the nervous filaments take their rise, without regard to its locality, internally or externally, a non-fibrous gray substance. Already, in the horse for instance, we see the gray substance in the different nervous bundles of the medulla oblongata entirely on the surface. This same gray substance is apparent between the chords, especially the posterior ones, and towards the lumbar vertebræ. The gray substance is evidently more internal in the posterior parts of the tubercles, and more external in the anterior part. The cerebellum contains within its interior, the *corpus ciliare* or fringe-like body, composed of gray substance, and the hemispheres are formed by the annular protuberance, and by the crura; all these parts have a large quantity of gray substance in their interior. And what are then the optic thalami, the corpora striata situated in the interior of the cerebral lobes, if not great masses of gray substance to give origin to diverging nervous bundles? A little more patience and much more circumspection are necessary, before general laws can be established!

M. Flourens commences with a spite against organology; he asks if all the sensations, judgment, memory, will, if all the faculties occupy concurrently the same seat in the cerebral organs, or rather if there is a separate seat for each of them? "See," says he, "some experiments which fully resolve, in my opinion, this important difficulty."

This question is very improperly put; he ought to have asked if all the instincts, all the mechanical aptitudes, the propensities, sentiments, talents, concurrently occupy the same seat in the brain.

The true fundamental qualities and faculties of the mind are the different propensities, instincts, sentiments, and the different intellectual faculties.

I have proved in the fourth volume of my large work, and I have made it sufficiently clear in this edition, that each fundamental power, essentially distinct, includes sensation, perception, memory and recollection, judgment and imagination; since these common attributes are nothing else than modifications, different degrees of each faculty. Even each propensity, each instinct, includes volition, in the acceptation that M. Flourens himself gives it in hens, pigeons, rabbits, &c. Thus so long as a single fundamental propensity or talent exists, all the general attributes also exist; so long as there exists a single atom of matter, a single plant, all the general attributes of matter and plants exist. Hence, so long as we shall not have destroyed all the seats of the fundamental powers, sensation, memory, judgment, volition remain. Let us now see the experiments of M. Flourens:

1st. "I removed from a pigeon, by careful and successive slices, all the anterior portion of the right cerebral lobe, and all the superior and middle portion of the left."

This way of experimenting supposes an organization of the brain absolutely contrary to that which really exists. Where has M. Flourens ever seen that the brain of any animal whatever is formed by layers? If he wishes to have us believe that, in his experiments, he tries to remove one faculty after another, he must attack each cerebral part, each division of fibres into bundles, at their origin in the medulla oblongata and spinalis, in the annular protuberance, optic thalami, and corpora striata; that he follows the same bundle, or this same particular organ to its ramification; and then, in returning, even to its interior commissure. This sole method of proceeding would be in conformity with the true organization of



the brain. But, to operate thus is impossible; M. Flourens has not even the idea of it, consequently all his experiments, even should he give us millions, never can have the least demonstrative value, as it respects the seat of any propensity or faculty whatever. He mutilates all the organs at once, weakens them all, extirpates them all at the same time.

"Vision became more and more enfeebled, and by little and little, as I advanced, (while he removed the layers,) and was not totally lost until the layers in the neighbourhood of the central nucleus of the two lobes were suppressed."

M. Flourens has not told us what is the central nucleus, and this central nucleus, precisely because it is the central nucleus, the origin and receptacle of all the rest; might it not be *that very limited small portion*, but sufficient to permit of the continuance of all the faculties?

"But, from the moment vision was lost, hearing was also, and with this and sight, all the intellectual and sensitive faculties."

Why does M. Flourens always insist on vision? the destruction of the brain, since, according to him, it is the seat of all sensation, and every intellectual faculty, should necessarily bring about the loss of all the senses, and all the sensitive faculties. Why then so many evasions?

2d. "From another pigeon, I removed by successive cuts, also very carefully made, the whole anterior and posterior portion of the two cerebral lobes, to within a few lines of their central nucleus."

We have the same remark to make here as before, "*to within a few lines of the central nucleus.*" How many lines of thickness has then the brain of a pigeon?

"As this ablation proceeded, the sight gradually and sensibly became enfeebled; hearing the same; all the other faculties like hearing and seeing; and when one was entirely destroyed, they all were."

Granting to M. Flourens that he has found the

measure of the successive diminution of sight and hearing. How in making his successive ablations has he also made observations on the relative diminution of the intellectual faculties of the pigeon?

3d. "Finally, on a third pigeon, I uncovered, thus to speak, and exposed the central nucleus of the two lobes, by the successive and gradual ablation of all the superior, posterior, and anterior layers.

"At each new cut, vision lost its energy; and when the animal no longer saw, he no longer heard, willed, remembered, judged, and was absolutely in the same condition with an animal entirely deprived of his lobes."

4th. "Thus, 1st., we can remove either from before, behind, above, or from the side, a certain extent of the cerebral lobes without destroying their functions. A limited portion of these lobes is then sufficient for the exercise of their functions."

I do not doubt that M. Flourens has submitted his pigeons to proofs, as ingenious as all his experiments. He must have seen, and who would not believe it, that such a pigeon still copulates, covers her eggs, feeds her young, makes excursions in the fields, makes a circuit around the pigeon house to reconnoitre the presence of an enemy, that she is still jealous, &c. Surely these propensities and instincts ought still to be fully and entirely exercised, for they are much inferior to the intellectual faculties.

"2d. As this slicing off goes on, all the functions become weak and gradually diminish in energy; and beyond certain limits, they are entirely destroyed. The cerebral lobes then concur in their totality in the full and entire exercise of their functions."

"3. Finally, when one sensation is lost, all are lost; when one faculty disappears, all disappear. There are not then different seats, neither for different faculties nor different sensations. The faculty of perceiving, judging, or willing one thing, reside in the same place as that of perceiving, willing, judging

another; and consequently this faculty, essentially one, resides in a single organ."

Let us reason like M. Flourens: We exhaust a man by bleeding: all the functions of the brain, cerebellum, *medulla oblongata*, *spinalis*, heart, lungs, stomach, &c., become enfeebled. We cut off his head, we kill him at a single blow: the functions of the brain, cerebellum, *medulla oblongata*, and *spinalis*, heart, lungs, stomach, &c., cease. Hence the faculties of sensation, thought, seeing, hearing, tasting, smelling, motion, respiring, digesting, circulating the blood, secreting bile, &c. &c., reside in one and the same organ. What! do you exclaim against this logic! ought it not to have the same privilege as that of M. Flourens, of being read, heard, opposed, and admired?

5th. "Each of the different organs of the senses have, no less, a distinct origin in the cerebral mass. We have already seen that the primordial principle of the action of the retina, and the play of the iris, is derived from the tubercula quadrigemina. In like manner, the senses of taste, smell, hearing, as well as vision, derive their particular origin from the particular eminence which gives rise to their nerves."

6th. "We can then, by destroying separately each of these particular organs, destroy separately each of the four senses which are derived from them; and we may, on the contrary, destroy, if not all these senses, at least all their result by a single blow, by the simple destruction of the central organ, where their sensations are effected and completed." But where is this central organ? As a very limited portion of the brain suffices for all the functions, and as all the parts concur in all the functions, this central organ is then each part, each little portion of the brain; thus this central point is either found throughout the brain, or is no where found.

"In the last analysis," says M. Flourens, page 122, "the cerebral lobes, cerebellum, tubercula quadri-

gemina, medulla oblongata and medulla spinalis, the nerves, all the essentially different parts of the nervous system, have all specific properties, peculiar functions, distinct effects; and, notwithstanding this wonderful diversity, as it respects properties, functions, effects, they do not the less constitute a single system."

How sublime is the mystery of ideology!

"One point of the nervous system being excited excites all the others; a point weakened enervates all; there is a community of reaction, alteration, energy. Unity is the grand principle which reigns throughout; it governs all. The nervous system forms then but a single system."

Unity is the constant dream, the *ne plus ultra* of declaiming metaphysicians. The universe is but one: millions of suns, planets, comets, are but one; the human race is but unity; different nations, the Chinese, French, Japanese, Indians, Africans, Americans, Germans, Turks, Greeks, are but one; man is one; the head, chest, belly, extremities, superior and inferior, the nervous, lymphatic, sanguineous systems, the liver, heart, intestines, &c., are but one. The senses, brain, cerebellum, tubercula quadrigemina, medulla oblongata, and spinalis, are essentially different; they have each different and specific properties, different particular functions, distinct effects. They are, according to Flourens, in a complete and fundamental independence of each other, page 127. Each of them can separately be preserved, destroyed, restored, as the organ of each is preserved, destroyed, or restored, page 102; and they are one!!!

The functions of the different parts of which the nervous system is composed, the functions of the brain, cerebellum, &c., may be destroyed and may subsist separately; the number of the senses and their functions is different in different species of animals; the functions, instincts, propensities, and intellectual faculties, are multiplied and modified, as the brain of different species of animals is more complicated and



modified ; the origins, reinforcements, ramifications of the different parts of the brain are different and separated from each other ; the intellectual faculties differ from the moral or affective faculties. One instinct, propensity, sentiment, differs from another ; the instinct of propagation differs from that of killing ; the instinct of the love of offspring, from that of travelling ; the talent of painting is not the sentiment of pride ; the talent of music, architecture, calculation, cunning, attachment, circumspection, memory of places, of persons, poetry, firmness, &c., are essentially different. These different instincts, propensities, talents exist separately, in the different species of animals, according as these animals are endowed with, or deprived of, certain cerebral parts ; they exist in different proportions in different individuals, and in the same individual, as certain parts of the brain are more or less developed than others ; the instincts and propensities of the same species are manifested at different epochs, not simultaneously, in the same individual, as certain parts of the brain arrive sooner or later at their maturity, or as certain parts undergo changes by the influence of climate, food, seasons ; in the same individual certain parts and certain functions of the brain may be changed, while others remain untouched. The same man excels involuntarily in one moral quality or intellectual faculty, and is for ever condemned to an unchanging mediocrity in another. These are undeniable facts. M. Flourens is wizard enough to reconcile them all with a single organ, with unity. You, with your good common sense, see this contradiction and absurdity : it is because you are not initiated in the art of foolish reasoning on the principles of high metaphysics.

Now I have nothing more very essential to say concerning the experiments of Flourens. It is nothing that a hen, page 124, deprived of her cerebral lobes, of all sensation, of all intelligence peculiar to the species, did not the less preserve, so soon as excited,

the faculty of running, flying, hopping, walking, with equilibrium and perfect regularity. It is nothing, again, that a duck, page 130, without cerebral lobes, without sensation, intelligence, walked, ran, jumped, flew with harmony, equilibrium, and perfect precision in all her motions; — that, page 131, a swallow, in the same condition, flew, ran, hopped with the same precision and grace as before the destruction of her sensations, volition, and intelligence. It is still much less that an *effraie* which, having lost by the ablation of its cerebellum the power of balancing and regulating its motions, presented notwithstanding, its beak and claws to its enemies, and was enabled, it is true with difficulty, to replace itself on its feet after having fallen over. Wonderful indeed is it, that that beautiful little animal, the dormouse, page 145, who, after having lost the cerebellum, sprang, seized, and bit the stick; the cat, page 144, the dog, page 145, who, after the same operation, preserved all their instincts and intelligence; the cat caught the rat that M. Flourens submitted, immediately after, to the same gentle operation, and the dog went to the chase, to furnish more ample materials for the indefatigable zeal of his master; and all this, as M. Flourens attests, during the torments of cerebellic mutilation; for without it, how would he have had a knowledge of the presence of all the instincts and intelligence of the cat and dog?

In the chapter on the application of his experiments to pathology, M. Flourens explains the difference of opinions on the seat of the soul, by the concurrence of the whole brain in all the functions: “the cerebral lobes,” says he, “can lose, either from before, behind, above, or from the side, a certain portion of their substance, without losing their functions.”

Yes; without losing the common attributes of every propensity or determinate faculty.

So long as a single organ remains, perception, sensation, recollection, memory, judgment, imagination, passion, affection, will remain. In all the experi-

ments of M. Flourens, there is not one, where the presence or loss of a single propensity or talent is proved. His assertion, then, is entirely gratuitous. Finally, if M. Flourens had not affected, in the whole of his work, to be ignorant of mine, he would have found this subject treated in the second volume, page 182 and the following; and he would have found the answer in the same volume, page 197.

“When the loss of substance exceeds a certain extent, the functions are destroyed.”

No doubt: organs being destroyed, their functions are also destroyed.

“The seat of the intellectual and sensitive faculties, provided the lesion does not extend beyond certain limits, may then be attacked in almost all points, without losing its functions, whatever may be the part attacked; on the contrary, if the lesion goes beyond certain bounds, all the functions are destroyed.

“The preservation or the loss of these functions depends, then, not precisely on such or such a given point of the cerebral lobes, but upon the degree of alteration of these lobes, whatever may be the point or points attacked.”

This reasoning is contradicted by a great number of pathological facts. Often, very considerable lesions of the brain have not, according to some authors, particularly according to those who hold to common attributes in any way, at least not ostensibly deranged the functions of the brain, while, frequently, very slight lesions have produced a general derangement of all the functions. I repeat it—the appreciation of cerebral lesions and their consequences requires, 1st. an exact knowledge of the organization of the brain and the reciprocal vital influence of its different parts; 2d. a detailed knowledge of the functions of the brain, of the different fundamental qualities and intellectual faculties, the instincts, propensities, and talents, &c. So long as an experimenter is not acquainted with these two indispensable conditions, all his experiments

to ascertain the *animal functions* of the brain and the different cerebral parts, are but the groping of a blind man. With this knowledge, he will acknowledge at the same time the impossibility of obtaining this end by any other means, than those which I have indicated, vol. III. page 106, 140, 141, 146, 151, 155, 160, 166, and the following, to page 216.

In all my researches the question was to discover, not the vital functions or the reciprocal vital influences of the different parts of the nervous system, but the *animal functions*, *moral qualities*, and intellectual faculties, and the seats of their organs.

"The cerebral lobes," continues M. Flourens, "effectively concur, altogether, in the exercise of their functions; it is very natural that one of their parts can supply another; that intelligence can consequently subsist or be lost by each of them."

Now I conceive that in natural or magnetic somnambulism, the solar plexus perceives and sees all the interior of the body; that the ear can be metamorphosed into an organ of smell, and the nose and the ends of the fingers, into organs of vision!

Thus then each part of the brain will be charged with all the functions; each part being placed, places there also all the faculties; each part removed, removes them all. To what good then does our study of the gradual perfection of animals tend? But, reply some, many cerebral parts, although all endowed with the same faculties, increase the energy of these faculties, which explains the different degrees of intelligence in the different species of animals.

In consequence of this supposition, the different species of animals should not differ among themselves, but by different degrees of the totality of the moral qualities and intellectual faculties, very nearly in the same way that a piece of lead of six pounds, differs from another piece weighing an ounce. But as certain species are deprived of certain faculties with which other species are endowed, it follows, that some



must be deprived of certain cerebral parts, with which others are possessed. How can we explain, on this hypothesis, the development and non-simultaneous destruction of the animal functions of the brain? How can you conceive of partial geniuses, partial idiots, partial mental alienations, precocious geniuses under one single relation, the different degrees of our different qualities and faculties, the contradiction, frequently so painful, of our qualities, the double man within us? Truly, if we consult ever so little, the most ordinary facts, the pretensions of our experimenter appear more and more absurd.

What M. Flourens says of the sympathetic nerve and solar plexus, is only the repetition of what I have said in my large work, vol. 1. pages 42 and 78.

At page 236, M. Flourens explains himself, as it were from remorse of conscience, in a more reasonable manner, on what he understands by the unity of the nervous system. "But," says he "independently of this peculiar and exclusive action of each part, there is a common action for each part, that is to say, of each upon all, and of all upon each."

Thus the cerebral lobes will and perceive; it is their *peculiar action*; the suppression of these lobes weakens the energy of the whole nervous system; this is their *common action*. The proper or peculiar action of the cerebellum is coördinate with the movements of locomotion; its common action is that of influencing the energy of the whole system, &c. The proper action of the brain, cerebellum, tubercles, &c., constitutes them *distinct parts*; but the energy of each of these parts influences the energy of all the other parts, and it is this which constitutes them parts of the single system."

Without these subtle evasions; I had said, vol. 1. page 77: "Each partial nervous system has its peculiar functions, although they all exercise a reciprocal influence, and are all more or less subordinate to each other."

"This being admitted," continues M. Flourens, "the whole question of the *unity* of the nervous system, is visibly reduced to the experimental estimate of the relation, according to which each distinct part of this system concurs to the common energy."

That being admitted, the whole question of the unity of the nervous system is reduced to a play upon words. I believe that I have expressed myself better when I said, vol. i. page 78; "The plurality of the organs does not exclude the unity of their action. A life takes place with many organs, and a single volition, with many instruments of voluntary motion. But if it were the reciprocal influence, which could impress on a system the character of the unity of an organ, all the parts of the animal would be an unity, since all the parts influence each other.

Since Flourens acknowledges this reciprocal influence, which I have always opposed to mutilatory experiments, *since an excited point of the nervous system excites all the others, since a weakened point enervates all the others; since there is a community of reaction, alteration, and energy: since the nervous system forms but a single system*, how can he boast so much of his isolation of mutilations and results?

I will say a word more on the physical researches of Flourens, touching the determinate or specific action of certain substances on certain parts of the brain.

His new and very ingenious experiments have two principal objects in view: the one, to confirm the speciality of the functions of the different parts of the brain, established in his other memoirs; the other, to show that the diversity of action of the different substances, is entirely the consequence of these substances acting specially by an affinitive election, on a different part of this organ.

The specific organization of the different parts of the body, and consequently the specific action of external agents, are admitted by all physicians. But has M. Flourens obtained as clear results, as well

marked and isolated by the employment of different substances, as he assures us?

"The rapidity," says he, "with which opium, belladonna, alcohol, act on small animals, hens, pigeons, rabbits, and especially small birds, allows us to multiply the experiments almost instantaneously, and to vary them in a thousand ways. The thinness of the walls of the cranium, interposes an almost transparent veil, between the observer and the phenomena."

"It was known that opium, taken in a certain dose, produces stupor, reverie, a certain intoxication of the senses, to which convulsions and derangement in the motions only ensued, when the dose was exceeded.

"It was known, that in the intoxication produced by spirituous or alcoholic liquors, the intoxication of the motions, the senses, volition, and intelligence, survive a very long time the loss of the equilibrium."

I add to this preamble of M. Flourens, that the different kinds of intoxication produced by wine, brandy, beer, &c., are different. Drunkards stagger, some forwards, some backwards, others sideways; some are dejected, others gay; some talk foolishly, others are eloquent; some give themselves up to an effusion of benevolence, others become maniacal, &c. It remains to be proved by experiment, when it is the cerebral lobes, when the cerebellum, and when the tubercles, that are specially affected.

"The watery extract of opium given to a sparrow in the dose of half a grain, produces after some time a slight lethargy. A stronger dose, one of two grains, produces as complete stupor, as the complete ablation of the cerebral lobes. In these cases, and as it is understood, in cases infinitely repeated, after the bones of the cranium are exposed, the whole region of the cerebral lobes is found exactly circumscribed by a spot of a very deep vinous red color; the posterior portion of the cranium presents its ordinary appearance. The osseous parieties being removed, the cerebral lobes appear red and gorged with blood;

and this color and this *engorgement* penetrate even to the most intimate molecules of their substance. The other cerebral parts, the tubercula quadrigemina, cerebellum, medulla oblongata, are neither changed in their color nor tissue."

"Now for the tubercula quadrigemina. A greenfinch, after having swallowed two grains and a half of the watery extract of belladonna, became, some time after, entirely blind, without any derangement of the other senses and faculties. The cranium being removed, all the region of the tubercula quadrigemina, that is to say, all the lateral and interior region of the parieties of the cranium, was found of a deep vinous red color. This experiment was frequently repeated, and always with the same result."

The cerebellum also is subject to this exclusive influence of spirituous agents.

M. Flourens caused many small birds, as sparrows, greenfinches, larks, linnets, goldfinches, &c., to swallow some drops of alcohol, not exceeding eight, and as the phenomena of intoxication manifested themselves, he laid bare the long parieties of the cranium. In all, the region of the cerebellum, and cerebellum itself, were found to the exclusion of other regions and other cerebral parts, colored with a deep red and gorged with blood.

Alterations, so strongly marked, so exactly circumscribed, so deeply impressed, the cerebral lobes by opium, the tubercles by belladonna, the cerebellum by alcohol, would certainly confirm the results of the experiments of lesion and ablation by Flourens, if both were not equally liable to doubts.

MM. Bailly, &c., and myself, have caused many small birds, sparrows, greenfinches, linnets, &c., to swallow the watery extract of belladonna, opium, and alcohol, in the doses indicated by Flourens; none of these birds have manifested an insulated symptom. All saw and heard many hours afterwards; all walked, flew, and most of them even sought food. We gradu-



ated the doses successively ; they all became more or less sick and dejected ; but they continued to see, hear, walk, and even fly ; they all endeavoured to conceal themselves. A little stronger dose of alcohol suddenly destroyed life. We decapitated the whole of them, whether they had taken the prescribed dose, or had swallowed a stronger one ; the crania laid bare in all, presented the transparent color of the brain such as it is in a state of health ! Neither the lobes, cerebellum, tubercles, nor even the bones corresponding to these parts, manifested any spot of a deep red color. Under the cerebellum only, where the heads had been separated from the trunk, there was in all an ecchymosis or *engorgement* of coagulated blood, evidently produced by the decapitation.

A remark, which throws a good deal of doubt on the experiments of M. Flourens, is, that the tubercles are situated so deeply on the base of the cranium in birds, that I cannot understand how he could remove a tubercle, and even two, and the animal should continue to stand erect, walk, fly, &c. The wound that this operation must necessarily make, is one of the most severe and dangerous, since it is necessary to extirpate the whole base of the cranium.

M. Flourens properly tells us, that these tubercles are placed at the inferior lateral region of the head, but he also tells us, that he sees them transparent when the head is fairly exposed. Now this is impossible. In the first place, the region of the cranium which corresponds to the external surface of the tubercles, is not only covered by muscles, but is very thick and spongy ; in the second place, the tubercles do not touch entirely the internal lateral parts of the cranium ; they are situated within them, exactly on the base of the cranium. Hence we have reason for suspecting, that our ideologist experimenter has a desire to regale us, after the fashion of romance writers, rather with fictions than realities, or like the transcendental philosophers, of constructing his world *a priori*.

We have given to a cock, two months old, thirty-six grains of the watery extract of opium. He ran about, flew, ate, without at all appearing sick, enjoyed all his moral and intellectual faculties; after having gone to roost, he awoke the next morning crowing and gay, and merrily joined his companions.

To a rabbit, four months old, we gave a drachm of the watery extract of belladonna; but neither sooner nor later, was the sight nor any other sense lost; his moral and intellectual faculties continued the same, as if nothing had happened to him.

How then can we justify these glorious declamations on the utility of similar experiments, on the important applications, that it is pretended can be made of them, to the physiology and pathology of man?

Let us terminate as we have commenced, by saying that in a thousand experiments of lesion and mutilation, nine hundred and ninety are either absolutely barren in results, or embarrass us, whenever they are performed by others, in interminable contradictions; that ten times at most, they serve to confirm what was already known, and that all this disposition to torment animals, in order to discover truths, will be constantly but a trifling amusement, of no consequence to science.

In order to justify my aversion to these mutilating experiments, I shall copy a passage from a very fine work of M. C. P. Ollivier, *on the spinal marrow and its diseases*, page 74.

"It results," says he "from the observations and researches recently published on the nervous system by MM. Foville and Pinel-Grandchamp, that the *corpus striata* and medullary fibres, which correspond to it preside over the motions of the leg of the opposite side; that the *optic thalamus* and its medullary fibres, that is to say, those of the posterior lobe, govern the motions of the arm; that when hemiplegia is perfect, we find an equally deep injury of both of these parts; and when it affects the arm and leg unequally,

it is because the alteration is not carried to the same degree in the optic thalamus and corpora striata; that finally, the cerebellum is the seat of sensibility; opinions, which accord with what experiments have demonstrated respecting the functions of the spinal marrow."

M. Flourens has frequently removed the lobes with the *optic thalami* and the corpora striata, and never has he seen paralysis ensue.

"This function of the cerebellum, (that is to say, that of being the centre of sensibility,) relative to the cerebro-spinal system, is not that which M. Flourens has pointed out. He believes himself justified in thinking, from his own experiments, that the cerebellum presides over the regularity of the motions of progression of the animal. The integrity of this organ must be perfect, says he, in order that the animal may find the necessary equilibrium in his locomotion. I do not believe that this conclusion, derived from experiments made solely on birds, can be applicable to all the vertebrated animals; for, the cerebellum is wanting in many of those in which the motions are not less well ordered, as frogs, toads, &c."

On this last point, M. Ollivier has been mistaken, as well as M. Desmoulins. But he might have added that Rolando makes the cerebellum the organ of the motions of locomotion, whilst M. Flourens only makes it the regulator or balancer of these motions; that the adder, which is not less agile than the eel, has a very little cerebellum, whilst the eel has a very large one.

"From recent experiments, M. Majendie regards the integrity of the cerebellum, as necessary to the performance of forward motions; for, he has observed that a moderately severe wound of this organ renders progression forwards impossible, and that it most frequently developes, on the contrary, a combination of motions which resemble the action of going backwards."

Another experimenter has maintained, that the cer-

ebellum was the cause of backward motions, and the brain, forward ones! Tell me, if these contradictory reveries ought not to disgust us entirely with this kind of researches?

Let us cite another passage of M. Ollivier, page 71.

"We have seen that the threads of the anterior roots, of the spinal marrow, are remarkably inferior in size to those of the posterior roots. This material difference is also connected with a difference of functions, which has been demonstrated by the experiments of MM. Charles Bell and Majendie. It results from these, that the posterior roots are for sensation, and the anterior, for motion. Nevertheless, adds very prudently M. Ollivier, it does not appear that each of these functions is exclusively given to each order of roots; for, when we excite the nerves of sensation alone, that is to say, the posterior roots, contractions are produced in the muscles to which these nerves are distributed, although generally they are much stronger and more complete, when the excitation is applied directly to the anterior nerves."

This want of complete isolation of the two functions in question, seems to me to depend on the circumstance that the two gray bundles of each lateral half of the marrow, are entirely confounded in each other at their point of contact; in another point of view, the very intimate union which takes place between the two roots below the spinal projection, must also influence their respective properties, and contribute further to unite them, if this expression is allowable, and combine them together."

M. Majendie expresses himself in a more decided manner, in his memoir on some recent discoveries relative to the functions of the nervous system, page 10.

"I have proved," says he, "by direct experiments, that these distinct roots, (anterior and posterior,) have also functions entirely distinct. The anterior are destined for motion, the posterior for sensation. If we cut off the first, the animal loses all motion, but



he preserves his sensibility untouched ; and, *vice versá*, if we cut the second, sensibility is lost, but the animal preserves his power of motion."

"I have recently had an opportunity to confirm on man, these different functions of the roots and nerves."

An individual had lost the motion of his arms for many years ; he still preserved a lively sensibility in them. He died, and on the examination of his body, we found the posterior roots in their state of integrity, whilst the anterior ones, which were evidently changed, had lost their medullary substance, and were reduced to their membranous envelope.

Although I am a little suspicious of this autopsy, other observations present themselves in support of the proposition of M. Majendie. M. Ollivier, page 334, cites an observation of M. Royer Collard, where the softening of the anterior part of the spinal marrow coincided with a paralysis of the inferior extremities. It is to be observed, that the motion of the superior extremities remained, although all the anterior part of the spinal marrow was converted into a sort of pulp. The paralyzed extremities had preserved their sensibility ; but observations are not wanting, where the contrary takes place. In general, it is the same with diseases, compressions, lesions, inflammations, &c. of the spinal marrow, as with mutilations of the different parts of the nervous system. Almost always, the accidents are confounded. Often the part above the place where the brachial nerves arise, is diseased, and there is neither paralysis nor convulsions except in the inferior extremities. In a man of twenty-one years of age, I have found the anterior face of the cervical and lumbar marrow exceedingly inflamed. He had had convulsive shocks in the arms and thighs, hiccough, vomiting, an extreme sensibility of the eyes, an insupportable heat in the chest, throat, palate, and tongue ; with convulsive motions and sensibility at the same time ; in a word, physicians will never be able to arrive, by the most exact observation of symptoms, to the knowledge of the seat of disease.

Professor Burdach,\* before the year 1819, page 363, had already performed experiments, to determine the difference between the functions of the anterior and posterior chords of the spinal marrow. He and professor Baer cut the anterior roots of the nerve of the right thigh of a frog; it at once lost all turgescence, became flaccid, insensible, and motionless. The animal hopped with the left hind foot. Then they cut the posterior roots of the nerve of the left thigh, and instantly the left thigh was paralyzed like the right. The frog crawled with the fore feet, and dragged the dead hind feet as a foreign body. They charged with the galvanic pile the spinal marrow positively, and the thighs negatively; there were convulsions in both thighs, without any observable difference in them. M. Burdach observes, that it is necessary to make new experiments as well on the anterior and posterior roots of the nerves, as on the anterior and posterior chords. He is induced to believe that the posterior chords are more irritable than the anterior. Already in 1815, Gross (in Thomson's *Annals of Philosophy*; February,) had declared that the anterior chords were the organs of sensation, the posterior, the organs of motion, &c. &c.

In my large work, vol. i. page 68, I have inquired if it was necessary to make any difference between the nerves of the sensations, and those of the motions?

This is my answer: Erasistratus had made this distinction; Torrigiano had rejected it, because, generally, the same nerve is the seat of sensation and motion. We add to this that the pathological phenomenon, in which, sometimes motion, sometimes sensation, is lost, takes place in those parts which receive nerves of voluntary motion only. We cannot demonstrate this difference by any method, neither in the different bundles of nerves at their origin, nor in their external course. It is besides certain, that all

---

\* Vom Bau und Leben des Gehirns. Leipzig, 1819.

the nerves of voluntary motion can also excite sensations in the whole surface of the body, and particularly at the extremities of the fingers, where they produce the sense of touch. Yet, why do the nerves of the senses have particular nerves for their special functions, and others for motion? Would it be sufficient, in order to explain the pathological phenomena, to suppose that they come from a simple modification, from a varied alteration of the same nerves?

In this uncertainty we have thought, that the posterior roots are stronger than the anterior, since we require more strength to straighten up and resist a burden, than to bend and stoop. The extension of the body even which takes place after death, seems to indicate this preponderance of the posterior nerves.

The idea has occurred to me, that perhaps the origin of the nerves of motion and of those of the senses, might throw some light on this point. But still here there is nothing permanent. The nerves of motion and those of the senses have their roots indifferently, sometimes in the posterior, and sometimes in the anterior face. The brain even and the cerebellum are the reinforced continuation, as well of the anterior chords as of the posterior and lateral ones. Thus the questions, viz., whether there are nerves solely belonging to sensation, and nerves solely destined for motion; whether these two functions are conjoined in the same nerves; whether in the same nervous chords there are filaments of sensation and of motion; whether, according to Scope, the ganglions belong solely to the posterior bundles; whether the posterior roots rather are destined for the sensations, and the anterior ones for the motions, or whether the inverse takes place; these questions, I say, are as yet, beyond the reach of our knowledge. The uncertainty becomes still greater, if it is true, that all the nerves evidently destined for motion, or the third, fifth, and sixth pairs, derive their filaments from the anterior and posterior continuation of the spinal marrow.

*Comparative Anatomy of the Brain in the four Classes of Vertebrated Animals*; vol. I. by E. R. A. Serres, &c. Paris, 1824.

Most decidedly the transcendental philosophy of Germany has taken possession of the heads of our French philosophers. MM. Berard, Jourdan, Flourens, Serres, &c., have constituted themselves proselytes of MM. Ocken, Carus, Rudolphi, Burdach, &c.

To hear these gentlemen, every thing in the nervous system is homogeneous, all is unity; the white fibrous substance gives origin to the non-fibrous substance; the nerves are formed from the circumference to the centre, and not from the centre to the circumference, &c. Before these physiologists, every thing was confusion, uncertainty, and error. Malpighi, Ruisch, Albinus, Haller, de Graf, Sæmmerring, Arsaky, Harvey, &c., *have all interpreted nature in an inverse sense; they have always supposed in her a course directly opposite to that which she pursues; ought we then to be astonished if her laws have been misunderstood?*

M. Serres proposes to himself, to unite in one body of doctrine all our acquired knowledge on the anatomy, physiology and pathology of the nervous system. The propositions announced, so piquant by their paradoxical appearance, constitute the object of his numerous researches. We shall follow him step by step, at least so far as his principles are opposed to ours.

### *Homogeneity, Unity of the Nervous System.*

"Follow," says M. Serres, page 17, "the human mind and nature in the physical and moral order: you will every where see man who separates and divides in his thought, and nature which unites in its action."

The philosophy of nature, and M. Serres, do quite the contrary of that which nature does. She operates



entirely in individualities ; each different effect is the result of a different cause. The transcendental philosophers operate by abstractions ; "they form from all their experiments one single fact, and from all truths, one sole and single truth. At the aspect of the varied forms which organized beings present, at the aspect of the innumerable modifications which their organs present, the mind is arrested, and overwhelmed under the weight of so many details ; and after long years of meditation, it proclaims the unity of organic composition," page 21. After this, is it man or nature which divides and unites ?

Page 54, M. Serres says without any preceding proof : " Thus then the brain of all classes of animals is brought back to an identity of composition, which does not permit us to mistake the homogeneity of its elements ; but by the progress of its development, this identity is effaced ; dissimilitudes are established either in all or only in some parts. The higher we ascend in the superior animals, the more numerous these dissimilitudes become, the more strongly are they pronounced ; the farther we descend in the lower animals, the more do they diminish and become indistinct ; the more does the brain retain its early physiognomy." This identity can only efface the forms, since, according to M. Serres, the elements are always the same. For their elements changing form and position, each subsisting in each class of new transformations, the whole of the brain is so far modified as to be no longer recognised from one class to the other. This is of no consequence to M. Serres ; there is no less a perfect unity.

After having spoken of the modifications that the different cerebral parts undergo in fishes, reptiles, birds, and the mammalia, he applies his logic to the cerebral hemispheres. "Certainly," says he, page 61, "if any one should wish, at first, to reduce the cerebral hemispheres of monkeys, to the cerebral lobes of fishes, he would fail in his undertaking. He would

perceive, on the one part, very simple organs, on the other, very complicated ones, having no external relation in their form, configuration, or structure. All the characters, which assist anatomists in distinguishing the homogeneity of organs, being absent, we should be induced to believe, that these parts are entirely dissimilar, and have no analogy with each other."

"But let us go very far back to the uterine life of the mammalia; we shall first perceive the cerebral hemispheres rolled as in fishes, into two vesicles isolated from each other. Later, we shall see them affect the configuration of the cerebral hemispheres of reptiles; later still, they will present to us the forms of those of birds; finally, they will acquire at the epoch of birth, and sometimes later, the permanent forms which the adult in mammalia presents."

"Suppose we reduce the whole of all these evolutions to four periods; we shall see at the first period, the cerebral lobes of fishes arise, and their *homogeneity* in all the classes; the second will give us the hemispheres of reptiles, the third will produce those of birds, and the fourth, finally, will give rise to the complicated hemispheres of the mammalia."

To this analytical demonstration, M. Serres joins that by synthesis:

"Take a monkey at birth: you will find in his brain all the parts, which distinguish the mammalia from the other vertebrated animals. Go back to the uterine life, you will first see certain lobes of the cerebral hemispheres disappear, also the hemispheres of the cerebellum, the corpus callosum and annular protuberance. What remains corresponds to the brain of birds. Examine an embryo younger still; the fornix disappears, the hemispheres contract posteriorly, the tubercula quadrigemina are exposed on the superior surface of the brain; we have then two geminal lobes as in reptiles, of which this encephalic mass reproduces the type. Finally, go farther back still in the uterine life, you will find the cerebral mass formed by

lobes placed symmetrically in a right line, the one by the side of the other ; you will find a cerebellum formed either of two parts, the one right, the other left, or, of a delicate layer partly covering the fourth ventricle ; you have, finally, the whole of the brain of fishes. Thus in ascending in the animal scale, from fishes to monkeys, you observe the brain gradually becoming more complicated, as in descending from adult mammalia to their different epochs of fœtal formation, you will perceive this organ successively become more simple. You come by these two courses to the same result, *to the unity of their formation and composition.*"

We must either refer this inference to a pure declamation that M. Serres wishes to partake with the transcendental philosophers of Germany, or the condition of writers is indeed melancholy. In proving the plurality of cerebral organs, I have based my inferences on the same facts which have induced M. Serres to decide on the unity of formation and composition. Let us admit, what is not true, and which M. Serres has very poorly copied from the Germans, that the brains of mammalia in the early periods of uterine life, resemble the brains of fishes, reptiles, and birds ; it is not the less true that the brains of the mammalia are, later, according as the species differ, more or less complex ; that in one species such a particular part is wanting, which is possessed by another. "In ascending from the inferior to the superior classes, we see this organ, at first so simple, approach gradually, in reptiles and birds, to that admirable organization which we know it possesses in the mammalia ; and to that structure, more admirable still, which man presents." From this very language of M. Serres, how can he establish as an axiom that "the brain of vertebrated animals is constructed on a uniform type, and *with the same elements* ?"

Are the brains of a blind or deaf animal, or those deprived of the sense of smell, composed of the same elements, as those of animals that see, hear, and smell ?

And can the brains of the rabbit, fox, tiger and elephant, of the pigeon and falcon, be composed of the same elements? Yes; the fibrous, and non-fibrous substance, the cerebellum, tubercles, hemispheres, &c., &c., are constantly found; but first, these parts are more or less simple, more or less complicated; in the second place, it is an absolutely gratuitous supposition, that the constituent parts of analogous organs, are identical in the different species of animals. All trees have ligneous fibres, and a bark, between which is deposited the cambium. Are these ligneous fibres, these barks, cambiums, on this account, homogeneous? All animals have a stomach, but we have not yet had a physiologist so silly, as to maintain that the stomach, which digests only vegetables, is identical with the stomach which digests only flesh. We possess the five senses, in common with the greatest number of mammalia; but is our taste identical with that of the goat, that feeds upon euphorbium with avidity? Many emanations which are powerful excitants to certain animals, are unperceived by us, &c. I have already so frequently refuted the identity and unity of the different parts of the nervous system,\* that I feel ashamed to be obliged to tell my readers, that, at this very time, partisans of this absurd fiction still exist.

“The nervous substance,” say they, *Archives Generales de Medicine*, Vol. IV., January, 1824, page 27, “is every where identical. It is nothing more than the rectilinear disposition of uniform globules. It has every where the same properties, those of sensation and motion. The diversity of its functions is merely apparent. This diversity results from a different arrangement of the same homogeneous matter. On this account, the organs the most varied as to form and position, can have the same functions. There is

---

\* See in the first volume of my large work, my treatise on the difference of the nerves and the functions of the senses.



no sensible difference in the globules of the olfactory nerve, and those of the optic, of the nerves of the anterior, and those of the posterior face of the spinal marrow."

Thus, since there is no sensible difference in the pretended globules of the different nerves, we must conclude that there is no real difference! By similar reasoning, the whole universe has been made to consist of identical molecules, the different arrangement of which constitutes the essence of all organic and inorganic beings, living and dead; a very convenient hypothesis for minds that are easily satisfied!

"In the mammalia," says M. Serres, page 9, "all the parts of the brain are very nearly the repetition of each other. Families induce some changes in their proportions and relations; but with very little attention, it is easy to restore them to the classical type, of which they are but a slight modification. In birds, this organ is still more permanent than in mammalia; all the families of this class are remarkable for the identical composition of their brain. From the smallest to the largest, it is but the repetition of the same elements, preserving always the same forms and the same connexions."

Let us dwell a moment on these passages, as remarkable for their falsity, as their boldness. Without again becoming tedious in relation to the different elements which must necessarily enter into the composition of the analogous parts of the brains of the different species of animals, let us compare only their brains, as to the forms which come under the observation of the senses, and under the relation of the parts of which the hemispheres of the cerebellum and brain are composed. They pretend to find a striking resemblance between the brain of the ourang outang, and that of man. But the difference of their volume is, first, as five to one; their convolutions differ greatly, as to number and structure; the anterior lobes, especially, are conically constructed, flattened above, exca-

vated below, &c. ; the difference is much more sensible still in the other species of monkeys. Even from one species of monkey to another, you will perceive the hemispheres differing, as to the number and structure of the convolutions. Can we call the entire absence of essential parts, a simple modification, or a modification only of the proportions of the different cerebral parts? Now, compare the brains of most of the mammalia, either with each other, or with that of man, and each species will present essential differences. Compare the middle lobes of the frugivorous, with those of the carnivorous animals; the brain of the hare with that of the cat, the dog with the sheep, the goat with the hog, the mole with the lemming, the brain of the guinea-pig with that of the weasel, the shrew-mouse with that of the rat. Do not forget at the same time, that all these differences are in direct relation with the difference in the instincts and faculties of these animals, and thus the path will be traced, by which you will be enabled to discover the functions of the different cerebral parts. Without doubt, in all brains the fundamental parts have received the same names; but have the oak and the ivy the same organization, because both grow from a seed, because both have a stalk which ramifies, has leaves, flowers, and fruit?

Cast the same investigating glance on the brains of the different species of birds. Compare the brain of the cock with that of the eagle, the brain of the stork with that of the swan, the sparrow with the goldfinch, the brain of the gros-beak with that of the cardinal, the pigeon with that of the cuckoo, the brain of the owl with that of the parrot; think, at the same time, of the difference and modifications of their instincts, and decide, if it would ever be pardonable to admit homogeneity of elements and composition.

You yourselves see; you delineate these differences; you admit the great difference that exists in the brains of reptiles and fishes. For what purpose, to what

end, are all these differences? Are they an idle freak of nature, or are they material conditions of the diversity of their faculties? But all this language of nature, so clear, so precise, is not understood by the physiologist, infatuated with the idea of centralization, and of the unity of conformation: by those who pride themselves in a high and elevated conception, in regarding the cerebellum as a reversed brain, the brain as a repetition of the spinal marrow, and the most distinct parts of the brain, as the simple repetition of the same homogeneous parts; by physiologists, who seem to be ignorant, that, when nature repeats an apparatus, she repeats also the function, and that when she has for an object functions essentially distinct, she creates also essentially distinct apparatus.

Is it not a pitiful caprice of our physiologists, to make such uncertain and minute researches on thousands of brains of reptiles, of fishes, &c., of the habits of which they have hardly the most superficial knowledge, — to tell, with more or less plausibility, what part is the olfactory nerve, the optic, auditory nerve, cerebellum, brain, tubercles, &c.?

Is it not ridiculous to treat these matters, which for the most part escape our senses, and on which the most experienced anatomists are not agreed, as objects of the highest importance, while they never dare to direct their attention, either to the difference of the cerebral organization in animals analogous to man, or towards the diversity of the mechanical aptitudes, instincts, propensities, and faculties, which constantly attend this variety of organization. The physiologist is always away from the question, when he reasons as a metaphysician; there is but one correct philosophy on the moral and intellectual nature of man and animals, which can safely guide him in his researches and inductions.

Let us return to the homogeneity of all the parts of the nervous system, and examine if each part is fit for all the functions; or, in other words, if the function

of one nerve, or one part, can be transferred to every other nerve, or every other part of the cerebral mass?

The ideas of the centralization, unity, homogeneity of the nervous system, are, as I have already said, reveries of the transcendental philosophy of Germany. They have been very warmly received ; 1st, because they were thought proper to combat the plurality of the cerebral organs, and 2d, because they favored the juggleries of animal magnetism.

Here again we have a proof of the power of induction of M. Serres : as a conclusion he repeats, page 567 :

“The cerebro-spinal axis forms a single organ ; the two substances which compose it, are continued from the vertebral column into the cranium, in all the vertebrated animals. This continuation is not a simple relation of contiguity. The medullary bundles which compose both parts, correspond in an admirable manner, from the brain to the superior part of the spinal marrow, or from this to the brain. This correspondence serves to complete all the proofs, that we have given, of the identity of the principal elements of the brain in the four classes of animals.

If you consider the pyramids, you observe that they are in direct relation with the cerebral hemispheres in all classes of animals. Whatever is the difference in form and size of the hemispheres, they are always in connexion with the anterior bundle of the spinal marrow, as may be seen in fishes, reptiles, birds, and the mammalia.

If you observe the cerebellum, you will constantly perceive its relations with the posterior chord of the spinal marrow in the mammalia, birds, reptiles, and fishes.

If, finally, you examine the tubercula quadrigemina or the optic lobes, you can constantly follow their connexions with the middle bundles of the spinal marrow or the *corpora olivaria*.

“This last relation is very important to observe in



birds, fishes, reptiles, and the mammalia, because it completes all we have said, on the analogies of these fundamental parts of the brain in all the classes of vertebrated animals."

First, M. Serres confounds the middle bundles with the corpora olivaria. These bundles exist in embryos before the appearance of the corpora olivaria; they exist in fishes, birds, the amphibia, which are notwithstanding deprived of corpora olivaria. Then what relation can parts, that do not exist, have with the brain or with the determination of cerebral parts, in fishes, birds, reptiles, and the amphibia?

Finally, if all these connexions prove the unity of the organ of the cerebro-spinal axis, every animal and all its parts will constitute but a single organ, since there is a connexion between them all. How can M. Serres and the partisans of this unity, conceive of the identity of the spinal marrow, medulla oblongata, brain, and cerebellum, seeing that there is always an augmentation of the two substances in these different parts, and that their functions are evidently and essentially different?

At page 2d of his preliminary discourse, M. Serres finds the idea of M. Dumeril sublime and classical. This philosopher said that the cranium of animals was but a vertebra, and the brain but the spinal marrow swollen out. Later, the cerebellum has been transformed into a reversed brain. *O tempora, O professores!*

*Can the Function of one Sense or Organ, be transferred to another Sense or Organ?*

After speaking of the different development of the different cerebral parts, in the fishes, reptiles, birds, and mammifera, Serres, following Carus, says, p. lxxxii; "Finally we shall find, that the faculties may be transferred from one element which is subordinate, to an adjacent element which then becomes the domi-

nant one." In the *Archives générales de Médecine*, T. II. Oct. 1823, p. 235, is the following passage. "It is very probable that in somnambulism, some nerves quit their proper sphere of action, and produce sensations similar to those, produced by the proper sensorial nerves in their sound and natural state."

Carus had already said, p. 305, with a thousand other credulous and metaphysical German physiologists, that the whole cerebral mass is homogeneous; that nothing prevents the functions of one part from being transferred to another, and that it would not be contradictory to any thing we already know, if, after the entire destruction of the hemispheres, the intellectual faculties, or consciousness, should still remain. On this supposition, the spinal marrow and nerves, the nerves of the senses, the plexuses and ganglions of the sympathetic nerve, may all, indiscriminately and reciprocally exercise any function whatever, of the nervous system. Nothing hinders an ox or a horse, from being equal in understanding, at least, at the moment of the magnetic influence, to Plato, Locke, or Kant, since the identical, and preponderant nervous mass of their senses, spinal marrow and sympathetic nerve, will amply supply the deficiency occasioned by the much smaller mass of their brains.

Do the French deserve the reproach of disdaining the productions of the German soil! We refute the calumny, by pointing to the history of animal magnetism, of the transcendental philosophy, of absolute spiritualism, of the centralization of the human brain, and of the homogeneousness and unity of all the parts of the nervous system. Can more sublime and generous concessions be required, to impede the progress of positive knowledge and check all spirit of observation?

"One of the physical laws of organic matter," says Serres, p. 407, is, "that dissimilar organs may discharge the same function. Thus, the skin and lungs concur in respiration; and this function is performed by

the gills of fishes, and the treacheæ of insects, — organs exceedingly different from the lungs of mammifera and birds. The skin and urinary organs may reciprocally perform each others functions. Locomotion may be transferred from the limbs, by which it is performed in mammifera and birds, to the coccygeal apparatus which occurs in the case of fishes, as has been happily observed by the author of philosophical anatomy, (Geoffrey St. Hilaire.) The sense of smell, Professor Dumeril has ingeniously observed, may be transferred from one nerve to another, and according to the observations of Scarpa, Carus, Jacobson, and Treviranus, the sense of hearing may, in part, be entrusted to the fifth pair. My own researches have proved, that the chrysochloris, (*Talpa Asiatica*, L.), the rat-mole, (*Mus maritimus*), the zemni, (*Mus typhlus*, L.), and the proteus, see by means of a different nerve from the optic nerve. Why may not the ganglion of the fifth pair, in the invertebral animals, be the seat and point of reunion of their different sensations? Had not Cuvier such facts in view, when he promulgated his general law of the action of the nervous system?"

On page 385, Serres mentions this general law of Cuvier, viz., the diversity of the functions of nerves depends more on the different organization of the parts to which they are distributed, than on their own nature.

Serres, then, has forgotten — what he might have read, in my chapter on the difference of the nerves, T. I., p. 127, 4to. — that Cuvier, in his *Anatomie comparée*, p. 192, has disavowed this general law, laid down, p. 95. There he says; "Analogous parts invariably receive their nerves from the same pair, in all animals, whatever may be the position of these parts, or however much this pair may be obliged to deviate from a straight course, in order to reach them. Analogous nerves always have a similar distribution; they always go to the same parts. Even the small pairs,

whose distribution is more circumscribed, or whose place may be more easily supplied by the adjacent pairs, as the fourth and sixth, preserve their existence and use."

As Serres is resolutely bent on giving to Baron Cuvier, the honor of a general law for the action of the nervous system, which will he choose, that on page 95, or the subsequent more precise and circumstantial one, on page 192? Being well aware, that such a paradoxical notion needs to be well supported by facts, he cites his own researches on the moles chrysochloris, rat-mole, zemni, and proteus, which showed that these animals see by a different nerve from the optic. I have never dissected the chrysochloris, rat-mole, zemni, nor proteus; but I have examined the organ of vision in the mole, and I have found the optic nerve exceedingly small, it is true, as in all the species of rats, mice, and other small mammifera. M. Bailly has subsequently confirmed my observation, and demonstrated it to Geoffrey St. Hilaire and Cuvier. I conclude it is the same with the other animals, where the investigation is a little difficult, on account of the smallness of their eyes, and visual nerves. On page 129, T. I, 4to., I have refuted this same error, committed by Treviranus, both in regard to the auditory nerve, which he says is simply a branch of the fifth pair, and to the optic nerve, the origin of which he derives from the same root, as that of the muzzle. What confidence can be placed in anatomists, who, like Treviranus, *Biologie der Lebenden Natur*, B. 1, page 459, maintain that the cerebral convolutions are wanting in many species of the dog family; that mammifera have no pyramidal bodies, and that their cerebellum, consisting almost entirely of the vermiform process, contains no nodule of gray substance, or ganglion? I shall have occasion to prove, that Serres is also very often deceived about things, far more obvious than the optic nerve of the mole, &c. When such gross mistakes are made in regard to large ani-



mals and man, how can we confide in researches infinitely more delicate, particularly when their results are in contradiction to the constant laws of nature? If these things were true, where would be the uniform type, so much vaunted on all other occasions?

The opinion expressed by Dumeril, *Memoire sur l'Odorat des Poissons*, lu à l'Institut en 1808, not respecting the smell of fishes, as Serres pretends, but their taste, which he banishes from the mouth and transfers to the organ of smell, I have also combated, T. I., p. 154, "but," says Serres, "by assertions, that can have no weight with men, who evince no partiality in their inquiries after truth." Let us see these assertions. "Supposing, with Dumeril, that fishes have no hypoglossal nerve, this, then, can serve only for motion, and the branches of the fifth pair, which they possess, are ramified in the different papillæ of their tongue and mouth. According to Dumeril, the constant pressure of the water blunts the taste of fishes; but why does not this same pressure also blunt their smell? Why, notwithstanding our habit of walking, does the sole of our feet preserve such an acute sensibility? Besides, the tongue of most fishes is moveable, and is furnished anteriorly with a fine, supple skin. It would be idle to spend more time in refuting an opinion, which charges nature with having created a special apparatus for nothing at all."

Here, too, are some more assertions from my *Treatise on the Difference of the Nerves*, which tend to destroy the opinion of Dumeril, Serres, Treviranus, &c.

A difference not only exists in the external, but a very distinct one, too, in the internal apparatus of the nerves. Their point of departure, their number of ganglions of reinforcement, their consistence, color, commissures, all their conditions, in fact, vary in different nerves. They are developed at different epochs. In man, the spinal marrow, the nerves of the muscles of the eye, and the trigemini are firm

and fibrous, and the olfactory nerve is large, and presents distinct filaments, while the brain and cerebellum are yet pulpy, and the optic and acoustic nerves seem to be entirely composed of gray substance. There is a striking difference between the soft, red, and whitish nerves of the sympathetic system, and the hard, white nerves of the spinal marrow. On the other hand, the delicate, nervous fibres of the brain and cerebellum are distinguished from the spinal nerves, by their whiteness, as well as softness. All the nerves differ in their configuration. The nerves of sense are not at all similar in point of color, consistency, form, and texture. Oftentimes, different filaments of the same nerve even, are visibly unlike. Not only different nerves, but the filaments of the same nerve, may issue from different ganglions, situated in different places. All these peculiarities remain the same in the same nerves ; and, therefore, the cause must be a primitive difference of internal structure, which is essentially necessary to a diversity of functions. This is the reason why it seemed so natural to Cuvier to conclude, " that the nerves are not entirely similar, and do not, for example, convey absolutely the same fluid as the arteries do ; but there is, in the structure of each, and in their mode of action, some peculiarity relative to the functions, and to the nature of the organ which they animate." Page 192.

'The proofs derived from anatomical principles, of a difference in the nerves, are strengthened by others, drawn from physiological principles. It is admitted, that the external apparatus convey different irritations and impressions to the nerves ; but if all the nerves are of the same nature, how happens it, that these different impressions from their peripheric extremities, are transmitted to the brain without alteration ? Ought not the impressions of the optic nerve to be transmitted differently from those of the auditory or olfactory nerve ? Supposing the mode of communication to be the same, but only stronger in one sense,

and weaker in another ; then, as Sømmerring has well observed, they would be only stronger or weaker, and consequently, would not be essentially different. A difference in the mode of propagation, therefore, necessarily requires one in the internal structure of the nerves. The same rule must apply to all the nerves, whatever may be their functions, since they are designed to propagate determinate, or specific impressions. The internal structure of the nerves must differ, when their action on the different parts differs. The secretion of the saliva of the gastric juice, of the bile, of the semen, of the tears, and the different kinds of irritability in all the parts, absolutely require different actions, and consequently different nerves.

Hence it is, that the nerves of the senses are able to perform their special functions, in consequence of inward irritations only, and without the concurrence of the external world. Our sensations in dreaming, are the same as those produced by external objects. A man who has lost his sight, dreams that he sees ; a pain is imagined to be felt in an amputated limb ; the flow of blood to the eye, makes us see sparks and brilliant objects ; a flow of blood to the ears gives rise to a singing and buzzing, and the same flow to the surface of the skin, makes us dream of being in the warm bath ; a blow on the eye, and the contact of two different metals, one of which is applied upon the upper lip and the other placed under the tongue, occasion light ; and finally, illusions of the senses in disease, are all derived from internal causes. Why, then, do you admit one class of nerves for motion, and another for sensation ?

Many nerves, commonly regarded as simple, originate by filaments arising from different points ; the fifth pair, for instance, arises from three different places, having three entirely different main roots. The olfactory and optic nerves, in mammifera, receive their filaments in their course, be it more or less long. The third pair arises in part in the blackish substance

in the bifurcation of the peduncles of the brain, and in part, in the gray substance lying over the bundles that are situated a little more externally. Thus, all the nerves arise from a greater or less extent of surface, and this apparently explains the numerous modifications, that the same nerve may receive. We see more than one color, and hear more than one sound; it is not a certain color or ray only, that we see, nor a certain sound only, that we hear. In one animal, the nervous filaments are sensible to certain odoriferous particles; in another, they are designed to receive others.

Why should a nerve invariably have the same origin, the same course, and generally, the same organization? Why does not an external apparatus receive its nervous filaments, sometimes from one adjacent nervous branch, and sometimes from another? Why this exactness, this minute adherence of nature to its usual ways? Why such a number of apparatus, if nature, which is always economical, could have attained its object with only one? Why is a whole sense annihilated, when the optic or auditory nerve is destroyed? Could not nature have prevented this loss by numerous communications of different nervous filaments, in the same way, that it remedies the effects of an obstacle in the usual course of the circulation of the blood, by anastomoses of vessels? If such assertions as these have no weight against the homogeneousness and unity of the nervous system, with men who evince no partiality in their inquiries after truth, I should be tempted to believe that M. Serres' impartiality expects more profitable returns from the incense which he flings out, hit or miss, to his guardian idols.

The localization of certain cerebral parts, the tubercula quadrigemina, for instance, is very justly used by Serres, as a ground for determining other parts of the encephalon. But how could any part whatever, or its function be determined, if this localization were not constant; if a certain cerebral part could occupy,



sometimes this place, and sometimes that, or if all the parts enjoyed indifferently, the same functions? Where would be the use of determining parts from their localization?

*Another Discussion of the Question, whether the Non-fibrous Substance of the Nervous System gives Origin to the White, Fibrous Substance.*

The non-fibrous gray substance is not first formed, and cannot give origin to the fibrous white substance.

The nervous system, as well as the whole organism, is not formed from the centre to the periphery, but from the periphery to the centre.

These are the two propositions to which Serres recurs on almost every page of his work. They are there so blended and interlaced with each other, that it is very difficult to isolate them. However, I shall try to render the matter a little clearer, and treat of each separately, as far as possible.

"The hypothesis of Gall and Spurzheim," says Serres, "is so blended with their facts, as to be incorporated with them, and we know not where it would have led us, had not Cuvier, in his memorable Report to the Academy of Sciences, paralyzed its effects." Page xlvi.

This memorable report, as well as all the writings of my opponents, will always be the most precious voucher I can have, of how far in the rear, the anatomical and physiological knowledge of the nervous system was at that time, and how much, in this respect, science is indebted to me! Without reminding M. Serres, that almost every point that was disputed in that report, has since been generally acknowledged and received by Cuvier himself; let me ask him to read in that memorable report, one of the eighteen propositions acknowledged to be true by the Committee, expressed in the following terms:

"That the gray substance is the origin and matrix of all the nervous fibres, and by its means, they are reinforced and multiplied." Considering this discovery a little too good for us to make, they tried by all manner of sophistry, to prove that it expressed a generally received opinion; but we refuted this position in our reply to the report, p. 70, &c.

Serres continues: "Gall's hypothesis is founded on the idea of the central development of the nervous system. It supposes, that the spinal marrow and encephalon, are formed from the centre to the circumference. The gray matter in the cerebro-spinal axis is considered to exist previously to the white matter at the periphery; to the nerves implanted in it; to the intervertebral ganglions, still more excentric; and finally, to the nerves that, from these ganglions, radiate to every part of the animal. This opinion, therefore, depends on the common notions relative to the development of this system."

"But if its formation is excentric; if all these parts follow an inverse order in their appearance; if the nerves are first formed in the organs; if, later still, the intervertebral ganglions are developed before the spinal marrow is in existence; and if this axis is itself developed from the circumference to the centre, we see that this hypothesis is utterly opposed to facts."

"We see that the intervertebral ganglions do not furnish the substance of the nerves which radiate from them, since these nerves exist before they do."

"We see that the spinal matter is not, and cannot furnish the substance of the chords that are implanted in it, since these chords do not primitively communicate with it, and frequently even exist without it."

"We see, finally, that the gray substance of this spinal axis, cannot be the organ of the nutrition of the white substance, since the latter is invariably formed first; since, in some animals, as the *Asterias*, for instance, the nervous system is formed exclusively

of white substance; and since in others, as certain fishes, we can scarcely find the slightest vestige of gray substance in the centre of the spinal marrow."

Besides, that all these passages are false assertions, the reader must be struck with the fact, that Serres could gainsay my proposition in no other way, than by espousing another extravagance of *natural* philosophy, and reversing the mode of animal organization.

Let us for a moment admit, with my countrymen, that the nerves proceed in a miraculous manner from the circumference to the centre, that is, from parts also formed before the centre. Let us admit, what indubitable facts establish, that nerves may exist without a brain, or spinal marrow; yet, does it follow that these nerves have not originated in the non-fibrous substance?

In our Memoir to the Institute, we compared the cortical, gray substance, with the mucons body that lines the skin, all its internal processes, the interstices of the muscular fibres, &c. Vicq-d'Azyr had already said that this mucous substance was analogous to the cortical substance of the brain and cerebellum. It forms with the nervous terminations various apparatus, in the brain, as well as in the intestines and external senses, such as the retina of the eye, the gelatinous tissue of the cochlea of the ear, and the papillæ of the tongue. Haller, too, had arranged the different peripheric terminations of the nerves under one category, in saying that the cutaneous nerves, whose trunks are so hard, are softened according as they part with their cellular tissue, and finally become pulpy in the papillæ of the skin.

"Although these papillæ," he says, "are never destitute of their envelope, and cellular substance, yet they are very soft in the tongue, skin, mammæ, &c., and are always penetrated by blood vessels. The same is the case with the expansion of the nerves in the muscles and heart. The difference of color observed in the net-work of the skin, is not contrary to that

analogy ; for if the mucous body, known by the name of the *rete Malpighii*, is differently colored in the skins of different men and animals, the cortical substance varies no less ; it may be grayish, blackish gray, reddish, pale, or yellow. The same diversity of color is found in the retina, in the pituitary membrane of the nose, in the nervous papillæ of the tongue and palate of different animals. The mucous net-work expanded under the epidermis of animals, presents an astonishing variety of colors. Van der Haar says : 'It is certain that the cortical part of the brain is a soft, pulpy, almost inorganic substance, covering the white part ; but it must be observed, that we find the same constituent parts and the same integuments in the nerves, with some insignificant changes. Can we not, and ought we not thence to infer, that cerebral substance exists in the smallest nervous filaments? How much farther is this pulpy or medullary substance expanded, when separated from its neurileme, or envelope, it is lost in the mucous body! Hence the reason why we cannot prick the skin with the finest needle, without touching the pulpy cerebral substance.' "

Serres cites Fouquet and Bordeu, who also liken the gray substance to the mucous tissue of the skin. Carus and Sprengel are of the same opinion.

If therefore the mucous tissue is nothing but the pulpy, non-fibrous substance of the nervous system, then the latter always gives origin to the nerves, whether they are formed from the centre to the circumference, or from the circumference to the centre. I appeal to the good sense of M. Serres, who appears to be so accessible to the demonstrative force of general laws, and present him the following :

The brain and cerebellum at first contain, in their interior, some large masses of gray substance, or ganglions, for the production and reinforcement of the fibrous, white substance ; and the whole surface of their nervous membrane is also covered externally, with the non-fibrous gray substance. This latter has



the same organic function as the interior; that is, it gives origin to the white, nervous fibres, which converge towards the centre, to form the various junctions or commissures. The existence of the pulpy substance in the extremities of the nerves of the senses, is beyond all doubt. Why then may it not be so with the extremities or expansions of all the other nerves? and why should not this pulpy substance have the same organic function, when placed at the extremities of the spinal nerves? Why should it not furnish nervous filaments, as well as when it lines the extremities of the nerves of sense, and of the hemispheres of the brain and cerebellum?

Those filaments, returning from the peripheric surface of the nerves, very satisfactorily explain how there may be nerves in the extremities, where there is no spinal marrow, medulla oblongata, nor brain. As the commissures are formed by the returning filaments, we understand why they are not formed, till after the hemispheres are sufficiently developed, to furnish returning filaments, and why also the chords of the spinal marrow and medulla oblongata, are not united by commissures. Let me add another remark of much greater physiological importance. I have proved that the organs of animal life have a double mode of function; their function is passive when they receive impressions, active, when they react on those impressions. We smell, and we scent; we see, and we look, &c. An apparatus is required therefore to receive impressions and transmit them to the brain; and another for external action and reaction; "one for sensibility and sensation; the other, for mobility and motion."

If I were not afraid of throwing a new apple of discord among experimental physiologists, I would say, that here is the mystery of the two orders of nerves which some physiologists seek for in the anterior and posterior, or inferior and superior roots of the spinal marrow. However this may be, it will

always prove, that, at least, one part of the nervous system is formed from the circumference to the centre; but that, at the same time, this order of nerves takes its origin in the non-fibrous, pulpy substance.

Let us see now, if in any respect whatever, we can admit that the fibrous, white substance, exists prior to the gray, or non-fibrous pulpy substance. None who have made the most faithful researches on the embryo, have found either nerve, organ, or intervertebral ganglion, existing previous to the spinal marrow; and the reason is, that they made their researches with the intention of seeing what actually is, not like others, prejudiced in favor of an hypothesis, which they are interested in maintaining. They all have seen, that at first, the canal formed by the membranes, is filled with a limpid fluid, which is nothing else but the pulpy substance, in a liquid, transparent state. At this period, it is impossible to recognise any organ. The extremities not yet existing, their nerves cannot exist. Thus the existence of the gray substance is prior to that of the nerves, and as I have proved, while refuting Tiedemann, prior even to the existence of the white substance of the spinal marrow.

In the second month, and not before, the rudiments of extremities begin to appear in the shape of little tubercles; but the cerebral vesicles are already distinct, and the liquid substance of the spinal canal begins to lose its liquid and pellucid appearance. In the embryos of the seventh and eighth week, we recognise the mouth, eyes, and the nasal and auricular openings. The limbs are terminated by a flattened part, from the rounded margin of which the fingers and toes subsequently appear. The head and spine have lost their transparency. The spinal column, the bones of the cranium, and the muscles of the back and neck, are not yet formed. The cerebral substance, at this time, has attained the consistence of the white of an egg. In embryos hardened in alcohol, we distinguish a part of the structure and disposition of the

brain and spinal marrow. The latter is very large and thick, compared with the size of the embryo. As yet, we distinguish only its two chords, but not a trace of fibrous structure. We see the rudiments of the cerebellum, of the tubercles, of the optic thalami, and of the corpora striata. Tiedemann has seen no nerve, at this period, coming from the spinal marrow, or brain. He presumes that their extreme minuteness renders them imperceptible. Neither has he been able to recognise any fibrous substance.

At the third month, we see the restiform bodies forming a thin, narrow cerebellum; and the peduncles, the optic thalami, and corpora striata are more perceptible; but the apparatus of junction, such as the corpus callosum, the fornix, the cornua Ammonis, have not yet appeared. It is not till the eleventh week, that the extremities are developed. The spinal nerves appear on the two sides of the marrow, and the optic and olfactory nerves are seen, terminated by a swelling.

From the anterior and outer margins of the optic thalami and corpora striata, arises the membrane of the hemispheres, produced by the radiation of fibres issuing from those ganglia, or masses of gray substance, which are the apparatus of reinforcement. All the spinal nerves have made their appearance, but the extreme softness of their tissue, and the thickness of their investing membrane, have prevented Tiedemann from tracing them to their origin. As even in adults, the nerves are very easily torn away at their origin, especially, the third, fourth, and sixth pairs, and all the pairs that come from the medulla oblongata, and medulla spinalis, an anatomist, without particular care, might be induced to think, that these nerves have no communication with the pulpy substance, their real origin. It is evident, therefore, that the gray substance, whether liquid and transparent, or thick and opaque, always exists prior to the white substance, to the chords of the spinal marrow, to the hemispheres, to the cerebellum, and to the nerves.

The white substance is never, in the slightest degree, formed previous to, or independent of the pulpy substance. Serres's assertions to the contrary, are entirely gratuitous. He relies on the authority of Cuvier, who once said, that in the asterias, the nervous system is composed exclusively of white substance. Cuvier once maintained too, that in fishes, the sympathetic nerve has no ganglions. Subsequent and more faithful observations have shown the contrary. I have examined the asterias, and have found as many ganglions, or masses of gray substance, in their nervous ring, as there are radii, or larger ramifications from this ring. In Burdach's work, (*Vom Bau und Leben des Gehirnes*), T. I, fig. 1, this ring and the ganglions are very well represented. Burdach expressly says, that in the asterias and holothurias, these ganglions cannot be overlooked. Merkel and Conrad have also described and figured them. Burdach adds, p. 205, that Carus had maintained, on the authority of Cuvier, that there was no difference in the nervous substance of the invertebral animals, but that Swammerdam had already distinguished the two substances in bees. He recognised, like Reil, some gray substance in the mollusca, and like him, too, Merkel holds that the gray substance exists, wherever there is any nervous system whatever. In insects, the gray substance occupies the interior; the white, the exterior. Even Carus has observed, that in the invertebral animals, the whole ganglion, or at least the nucleus, exists in the gray substance. In the *Ascaris lumbricoïdes*, Baer has observed the same swelling, and the nerves which proceed from, or have, he says, with Burdach, proceeded to them; a view which is adopted by Serres.

"Pursuing his notions on the encephalon," continues Serres, "Gall says that the grayish swelling of the brothers Wenzel, is the matrix of the auditory and facial nerves. This supposes, that the swelling exists previously to the nerves, but not only are these nerves formed without the cranium, and at first with no com-



munication with the encephalon, but even when they have reached the spinal marrow, the gray matter of the tænia of the Wenzels, has not yet appeared. This swelling is not developed, till many months after the nerves are implanted in it."

There are several things in the passage, which M. Serres will pardon me, for not believing, merely on his word. Let us admit, for a moment, that the auditory nerve exists before this swelling. We have never said, that the tænia is the sole origin, the only ganglion of the auditory nerve. I have always thought, that it was with this nerve, as with almost all the rest — that the more perfect the function is, the more numerous are the origins; and the origins multiplying, the number of their ganglions increases, the nearer the nerves approach the epoch of exercising their functions. Thus, Serres himself acknowledges, the two largest swellings of the spinal marrow, coincide with the appearance of the limb. Thus, too, the olivary ganglions and corpora geniculata also appear, subsequently, though not after the nervous filaments to which they adhere, to give origin to new filaments, designed to reinforce those already formed. Serres deceives himself or his readers, in attributing to us the opinion, that the corpora geniculata are the sole origin of the optic nerve, in order to fasten upon us the conclusion, that the nerve exists before the gray substance. How could Serres imagine, that nerves coming from the circumference, could plunge into these ganglions, if they did not exist, at least, simultaneously?

Serres says, p. lii, that the medullary bundles of the pons Varolii are developed before the gray substance of the pons itself, and that the peduncles of the pineal gland are invariably formed before the gland. To publish such errors with so much assurance, leads us to suspect, that M. Serres counts upon the ignorance of his readers and judges. So long as the ganglion called the pineal gland, does not exist, its peduncles do not exist. Tiedemann never saw this

ganglion till the nineteenth day, when he could also recognise two little peduncles. The medullary bundles of the pons Varolii, are the commissures of the hemispheres of the cerebellum, and their existence and successive increase coincide with the formation of the folds of these hemispheres. It is precisely in the canal, in the medulla oblongata, and in the pons Varolii, that the gray substance abounds, before we can distinguish any fibrous substance. The numerous instances of such incorrectness, must caution us how we give our assent to Serres's assertions, before verifying them ourselves.

What Serres says of the centrum ovale and of apoplectic cysts is founded, partly, on a mere chimera, since the centrum ovale is an artificial production, and partly, on an interpretation so arbitrary, that I may dispense with replying to it.

Unless Serres is willing to admit an eternal vacillation in the laws of the formation of the nervous system, we can, every moment, find in his own observations, things that refute his hypothesis. He says, page 45, that the surface of the optic lobes assumes a whitish aspect at the tenth day of incubation, by which they are distinguished from the anterior lobes that are always gray, and from the cerebellum, which is of a reddish gray. This white color becomes more and more marked, at the fourteenth, eighteenth, twentieth, and twenty-first days of incubation, and this constitutes the normal state of the interior of these lobes in all adult birds. The aspect of these lobes is grayish, until the ninth day, when there appears in their interior some whitish striæ, which gradually enlarge, till their margins touch and unite together, and in this manner is produced a medullary layer, which forms a kind of cortex over their whole periphery. Until the twelfth day, the whole mass of the exterior lobes is of an ash gray; but at this period, and during the fourteenth, fifteenth, and sixteenth days, even till birth, we perceive some whitish

fibres, forming a thin layer on the inner part of the lobes, and which may be very readily distinguished by separating them. At their base, we see them uniting together in a pellicle.

In the spinal marrow of lizards, observed twelve days after birth, Serres has seen in the interior of the gutter that forms the spinal marrow, a substance browner and more liquid than the lateral parts of the chords, extending the whole length, and lining the whole inside of the spinal marrow. He says, page 105, that the spine, or canal, is at first filled with a liquid, and that the layers of the marrow become successively thicker, in proportion as the liquid takes the consistence of gray matter.

Now I leave it to the reader to decide, whether Serres is wrong in maintaining the priority of the existence of the fibrous, white substance, or whether the laws of the organism are complaisant enough, to accommodate themselves to the caprices and inconsistencies of anatomists.

In the following passages, particularly, Serres declaims against the idea of the white substance being posterior to the gray, and originating in it.

“I remark, in the first place, that in the system of the German physiologists, the gray matter is supposed to be the matrix, or nutritive matter of the white; —a revival, apparently, of the hypothesis of the secretion of spirit by the gray substance, of which the fibrous matter constitutes only the excretory ducts.”

The stem nourishes the cherry, therefore, according to Serres's reasoning, it follows, that the stem secretes the spirits, and that the cherry is the excretory duct. To find a man guilty, it is merely necessary to invent a crime, a manœuvre that has been very often practised upon me.

“The two hypotheses,” he continues, “suppose a direct communication between the two substances, which indeed is the case in the cerebellum and cerebral hemispheres of adult animals, but not in the spinal

marrow and the corpora striata ; for, in the mammifera and birds, we may remove every layer of the gray substance of the spinal marrow, without in the least involving the white substance. In the mammifera, we may also remove the gray matter of the corpora striata, without tearing or otherwise affecting the fibrous matter."

These are bold assertions wherewith to astonish novices in anatomy. Wherever there is gray and white substance, there exists a direct communication between them. Nervous fibrils, however, which issue from the gray substance, are so fine and delicate, that the slightest force is sufficient to rupture them. What precautions are necessary, in order to preserve the adhesion, the direct communications of the third, fourth, sixth, eighth, &c., pairs of nerves ! The communication of the nerves with the gray substance of the spinal marrow, can be seen only by carefully pulling out one of the stoutest nerves, when there will always be found a little bulb of gray substance, adhering to the central extremity of the nerve. Can an anatomist, on whose faith we are required to believe so many invisible marvels, assert that the corpora striata have no direct communication with the white substance ? What then is the use of those numerous large, white, and fibrous bundles in the corpora striata, and which, having traversed them, expand like a fan, in order to form a part of the inner layer of the cerebral membrane ? And how are those white, fibrous striæ and bundles formed ? Make an incision in the gray substance which presents itself in the ventricles, or remove a thin layer by scraping, and you will see an infinite number of very white filaments, proceeding towards the large bundles for the purpose of reinforcing them. The same thing is evident in the outer half of the corpora striata, enveloped in some little convolutions under the middle lobe, and also in the optic thalami, in the great peduncles, pons Varolii, &c. In fact, we may raise and unfold these little



convolutions, that envelope the outer and greater half of the corpora striata, without affecting the latter; but these convolutions are not formed directly by the gray substance, — they are nervous bundles, white striæ, resulting from the confluence of innumerable filaments formed in these large masses of gray substance.

Serres continues: "In the primitive state of young embryos, the layer, which forms the cortical substance of the cerebral hemispheres, is placed only in juxtaposition to the layer of white matter; they do not even adhere together. Ruisch removed in an infant, the whole cortical layer of the hemispheres, without affecting their white substance. If we believe in nutrition, how is it effected? Are there canals of communication between the two substances, as is admitted in the hypothesis of animal spirits? What is the nutritive fluid, and how does it circulate? What is the matter of reinforcement? These things are not explained."

Our anatomist, then, does not know that the blood-vessels of the pia-mater or vascular membrane, penetrate into the cortical layer, traverse it and follow, uninterruptedly, the fibrils of the subjacent layer of white substance? In separating the gray from the white layer, these vessels are necessarily torn — the first reason, why the white layer is involved. I have often removed the gray layer in adults and children of different ages, and I have invariably seen, that the gray substance of this layer, is every where penetrated by white filaments, which are continued into the white layer, and which we cannot avoid breaking — a second reason, why the white layer must inevitably be involved. If, then, the blood-vessels have any thing to do with nutrition, Serres will discover in this disposition, the means of nutrition and reinforcement.

"In the second place," adds Serres, "a consequence of this hypothesis is, that the gray matter should always be in proportion to the white. But, in the

spinal marrow, this relation, instead of being constant, is, in fact, inverted. 'Thus, as we descend the scale of mammifera, from the monkeys to the rodentes, and from them to the birds, the white matter goes on increasing, and the gray diminishing. In all the fishes, the predominance of white matter is still more marked, and in many, we shall hardly find a vestige of gray matter in the spinal marrow. This hypothesis, therefore, being in manifest opposition to facts, is not admissible.'

What may be the proportion between the two substances, I cannot say, but not permitting myself to give supposition for facts, I can announce it to be a constant fact, that the more copious the white substance is, the more copious also is the gray. The layer of gray substance, that furnishes the numerous filaments of the olfactory nerve, and its bulb of gray substance, as the cribriform bone, are much larger in the mole, dog, ox, &c., than in man. The tubercula quadrigemina, one of the origins of the nerve of vision, and the tænia, the ganglion of reinforcement of the auditory nerve, are much larger in the horse, &c., than in man. The optic thalami, the corpora striata, the pons Varolii, the crura cerebri, are always in proportion to the hemispheres, — much larger in man for instance, than in the greatest part of the mammifera.

The medulla oblongata is proportionally more swelled, and more abundantly furnished with gray substance, in most of the mammifera, because it gives origin to larger nerves. In the spinal marrow, the swellings whence the brachial and crural nerves arise, so predominate over those that give rise to the other pairs, that anatomists, for want of sufficient attention, still overlook the latter. Here then is a general law, that undergoes many modifications indeed, but admits of no essential exception.

In the polypi, &c., the two nervous substances are still confounded, and here, there might be some ground for talking about homogeneousness, and unity of com-

position. The gray, or rather the non-fibrous substance, nowhere exists, not even in the brain of the mammifera, entirely pure, completely isolated from the fibrous substance. Examine carefully the gray substance of the pons Varolii, of the tubercula quadrigemina, the pineal gland, the olivary bodies, the corpus fimbriatum, the fourth ventricle, the peduncles of the brain, the optic thalami, the corpora striata, and corpora geniculata; examine the gray substance that surrounds the union of the optic nerves, that which gives origin to the numerous filaments of the olfactory nerve in brutes, the bulb on the cribriform bone, even the striæ of gray substance, which accompany the olfactory and optic nerves in man; examine the gray substance of the mamillary bodies, that which is found in many animals, the wolf and dog, for example, on the posterior fold of the great commissure of the hemispheres, and you will see, that it is every where mixed with nervous filaments, and thus intimately penetrated with white substance, which proves, that those filaments arise there, and that it is not always essential to their function, that they should form nervous chords, separated and distinct from their very origin. How, in this case, are we to estimate the different proportions of the two substances, in birds, ophidians, saurians, &c.? According to Serres, it may be, exclusively, the gray substance, or exclusively the white substance, that exercises the functions of the whole nervous system; for he asserts, though in opposition to Swammerdam, Meckel, Konrad, Reil, Carus, Burdach, &c., that in the invertebral animals there is no gray matter, and that their nervous system is formed exclusively of white substance.

In Burdach's work, T. I, Pl. I, fig. 4, is a faithful drawing of the nervous system of the crab. All the little collections of gray matter, that give origin to the nerves; that is to say, all the ganglions are very well marked, particularly those that send nerves to the nippers. Even the five ganglions of the tail, form very

distinct swellings. Serres's figures are far from being true to nature; they are very inaccurate, and coarsely executed. In my large work, T. I, Pl. I, fig. 2, is the spinal marrow of the hen. At first, the collections of gray substance form ganglions at the origin of each cervical nerve; then comes a very broad, and pretty long swelling for the nerves of the wings; the other ganglions form swellings, till we come to the largest of all, those for the crural nerves. In birds, however, whose powers of flying predominate over those of running, the order of size in these two large swellings, is reversed. But it is invariably the case, that the gray substance is as abundant in birds, as in the mammifera.

In his remarks relative to the gray substance of the spinal marrow of fishes, Serres appears to have reference to an observation of Arsaky, who professes never to have seen gray substance in the spinal marrow of the zitterochen, (*Raia torpedo*, L.) But he found that this canal has a cavity, presenting the same form as that produced by the gray substance in the interior of the spinal marrow in other animals. It is to be presumed, therefore, that Arsaky made up his opinion hastily, and for a still stronger reason too, that in all other fishes, the gray substance of the spinal marrow is managed in the same manner. As in the mammifera, it is more abundant in the upper than in the lower region, which makes the dorsal furrow deeper than the abdominal; it is visible externally on the sides, at the origin of the spinal nerves. See Carus, p. 131, and Pl. II., fig. 16 and 15. Tiedemann also has observed, p. 86, that in all species of fishes, the walls of the canal of their spinal marrow, are furnished with gray substance.

The same is the case in the nervous system of voluntary motion in the caterpillar, (large work, Pl. I, fig. 1), as Serres himself acknowledges. But he maintains, with some German anatomists, that this system is not analogous to the spinal marrow of fishes, birds,



and the mammifera. This system reaches from one extremity to the other, on the median line, and presents very distinct cords on the right and left. At each segment of the animal, these chords swell into a ganglion, which furnishes to the right and left side nervous filaments, that are distributed to the muscles of each segment, that executes voluntary motion. A man must have a rage for singularity, to mistake this system, which is not merely analogous to, but is precisely the same as that of voluntary motion in fishes, birds, and the mammifera.

Serres denies, p. 557, apparently on the authority of Carus, that the spinal marrow presents any swelling, formed by the gray matter at the insertion, according to him, and the origin, according to me, of the spinal nerves. "In no class," says he, "do we see a series of swellings, corresponding to the series of the insertions of the spinal nerves. The spinal marrow of fishes is particularly remarkable in this respect. We have observed no swellings in it, though the spinal nerves are very much developed, especially in the cartilaginous fishes."

Carus says, that these ganglions of the spinal marrow do not harmonize with the organization of the mammifera, p. 218. Why not?

I was the first to recognise, in the spinal marrow, the two large swellings of the lower and upper limbs, because they had no idea of the use of the gray substance. And now they would voluntarily sacrifice this truth, if their eyes did not present too large an obstacle to the spirit of party. What anatomist dares to deny the existence of these ganglions in the caterpillar? and if they are disinclined to acknowledge the most striking analogy, I appeal to birds of all classes, and to all the mammifera. What confidence can be put in anatomists, who refuse to believe the testimony of common sense, and their own eyes? They see, that wherever there are swellings of gray substance, there arise, or if Serres prefers, there are inserted, nerves. They

see, and are forced to avow, that where the largest nerves originate, we have the largest swellings. They profess to be the partisans of general laws, and are inconsistent enough to pretend, that the other smaller nerves do not require smaller swellings. Snakes, having neither anterior nor posterior limbs, are also devoid of the two large swellings in their spinal marrow; but, at the origin of each pair of nerves from their long spinal marrow, there is invariably, a little round swelling. Carus also says, p. 173, that after careful examination, it can no longer be denied, that these swellings exist at the origin of the nerves, in the spinal marrow of the *Coluber natrix*. The same is the fact in the eel, and all fishes, even in the *Tetraodon mola*. Although the length of the spinal marrow does not exceed that of the brain, yet these swellings are very distinct, (Carus, p. 128.) It is understood, that the swellings, corresponding to the fins, are the largest. The *Trigla* genus, remarkable for the separation of the rays of their pectoral fins, are also remarkable for a series of swellings proportioned, in number and volume, to the number and volume of the same rays, to which they correspond, (Cuvier's Report on Serres's work, p. xxii.) The electric fishes have also a considerable swelling, corresponding to the nerves that are distributed to the electric apparatus, (p. xxiii.)

Again; if we will examine those animals whose vertebræ are quite long, we shall see, that the canal in each vertebra is invariably enlarged at the two extremities, where it is contiguous to the other vertebræ; and it is in this place, at this enlargement of the vertebral canal, that the ganglions are placed. In order to avoid repetition, I refer the reader to what I have said on this subject, T. I, 4to. p. 37, &c. &c.

Why does Serres admit, that the medulla oblongata, pons Varolii, optic thalami, corpora striata, present swellings of gray matter, in a certain relation to the white substance, which originates in it, or, as he says,

that these swellings are in relation, in the different classes, to the volume and number of the medullary bundles, which traverse them? He admits it, because these parts are so voluminous, that his readers could not be imposed on, unless they were totally blind.

“But,” says Serres, “does this prove that the white matter originates in the gray? Anatomy returns a negative to this question; for Ruysch never succeeded in reddening the white matter in his injections, and Willis never could demonstrate fibrils, issuing from the gray matter and proceeding to form bundles. Malpighi failed in his attempts to trace the white bundles from the glandular follicles, of which we considered the gray matter to be composed. Have Gall and Spurzheim succeeded any better? I find no proof to that effect in their works.”

Yes, Gall and Spurzheim have succeeded better; and M. Serres may enjoy the same happiness, whenever he is inclined to consider the swellings of the spinal marrow and medulla oblongata, the pons Varolii, the tubercles, the optic thalami, the corpora striata, the bulb of the olfactory nerve, the pineal gland, the mammillary bodies, &c. &c.; his eyes will every where light upon numerous nervous filaments, which are formed in the gray substance, and issue from it, for the purpose of forming nerves and nervous bundles. Serres goes so far, p. 569, as again to rest upon his great authority, M. Cuvier, who, as I have already shown, from a passage in his report, was one of the first to recognise this discovery.

It is said again, that, if these swellings of the spinal marrow did really exist, we ought to see them in embryos, where, however, we find nothing like them. How far, we may ask, has this been well observed? The olivary body, the corpus geniculatum, are not seen in embryos; are we to conclude with Tiedemann and Serres, that they do not exist in adults?

After these digressions, Serres reminds us again of some of his numerous errors; for example; “that in

all embryos without exception, the white matter is formed before the gray in the spinal marrow." Refuted in the review of Tiedemann's work. Again, that in the olivaria, the white matter is developed before the gray. "Frequently even," he says, "the latter is not formed at all, as in birds, reptiles, and fishes."

Such assertions prove, how little Serres knows of the true laws of the successive formation of the parts of the nervous system. So long as the gray substance is not in existence, the white, which is formed and continued by it, does not exist. At this period, the parts of the brain dependent on this ganglion (the olivary bodies) have not yet appeared, and never do appear in the simpler brains of the reptiles, fishes, birds, and even the mammifera, excepting man only, and perhaps the monkeys. This is the reason, why these animals never possess the olivary bodies. As soon, however, as the new cerebral parts are to be formed, the matter to be used for this purpose must be deposited from the circulation; the olivaria appear, and with them their white substance, that is, a particular bundle, whose direction is different from that of the bundle wrongly called the middle bundle, from the erroneous impression that there are three bundles, on the anterior surface in man, and the inferior surface, in brutes, of the spinal marrow.

Carus has charged me, (T. I, p. 280, and 287,) with having declared the olivary bodies to be ganglions of the hemispheres, or as he expresses it, ganglions of the optic thalami and corpora striata, which he has called ganglions of the hemispheres. It is notorious that we were the first, who, upon physiological principles, conceived and published these peculiar views of the use of the ganglions. (See T. I, p. 282 4to. and a thousand other places.) In respect to the olivaria, we held the following language. "The olivary bodies are only a ganglion, like the corpus fimbriatum of the cerebellum. A large bundle proceeds from the ganglion, which ascends with the posterior bundles of the



great swelling, behind the coarse, fibrous bundles. All these bundles ascend, like those of the pyramids, between the transverse fibres of the commissure of the cerebellum. In their passage, they are reinforced. Above the ganglion, they constitute the posterior and inner part of the large fibrous bundle. They acquire their greatest increase, at their entrance into the large fibrous bundle, from the great mass of gray substance collected there, and which, with the nervous filaments it produces, forms a ganglion, pretty hard, flattened in the middle, and unequal above and behind." The olivaria, therefore, according to our views, only concur with the gray substance of other ganglions, in successively augmenting the fibrous bundles. Carus rejects this opinion, because, says he, the olivaria exist in but a few mammifera. Once I really thought, that the olivaria existed in the large mammifera at least, since their medulla oblongata is very much swelled out on the outer side, and that being much smaller than in man, they were buried in the prominent part. Since Carus's work appeared, I have again examined the medulla oblongata in the ox and horse, and as I have never been able to discover any thing like the interior of the olivaria in man, I believe, with him and Serres, that the olivaria do not exist in them. But I cannot agree with Carus, that we ought not to admit a series of several ganglions, as the complement of the organization of a nerve, or a hemisphere. The nerve of vision, certainly, has several ganglions of origin and reinforcement, and so has the olfactory. So, too, besides the pyramids, the olivaria, the annular protuberance, the great fibrous bundles, the optic thalami, the corpora striata, must be considered as so many apparatus of origin and reinforcement for the hemispheres of the brain. As in the formation of the nerves, so it is in that of the hemispheres, the more perfect the hemispheres are, the more numerous are these ganglions, or apparatus of origin and reinforcement; so that sometimes

the corpora striata, sometimes the optic thalami, and sometimes the olivaria are wanting. Carus says that this view involves the idea, that one part is produced by another part, which would be incompatible with organization, because each part, he thinks, originates in the place where it actually is. In fact, each part does originate in the place where it actually is, but it is necessary, that the organization should first arrive at that place, where a new apparatus is to originate. I do not say that the ganglions originate from one another, but that each ganglion produces a certain number of nervous fibrils, which, in order to acquire a fresh increase, must pass through a new collection of non-fibrous substance.

We have taken some pains to follow the nervous bundles produced by the olivaria, and we have never succeeded in tracing their course into the tubercles, as every body else professes to do. According to Carus, these tubercles exist in man, at the third foetal month; according to Tiedemann, much later; and according to Serres, they are not visible till the fifth month, when the olivaria have not yet appeared. The latter are evidently wanting in the reptiles, fishes, and birds, where these tubercles are very large. These tubercles are much larger in the large mammifera, than in man, and if the olivaria be not altogether wanting, they are, at least, not distinctly visible. Thus our first idea is confirmed, that the olivaria are a true ganglion for the same convolutions, which acquire their entire mass of fibrous substance in the optic thalami, and that they have no connexion nor relation with the tubercula quadrigemina.

3. "The white bundles constituting the trapezium, are developed before the grayish swelling of the Wenzels, which is considered as their ganglion."

Why not say, which is considered as one of their ganglions — a ganglion of reinforcement. As to the rest, we have the same error, and we return the same reply.

4. "The medullary bundles of the pons Varolii, appear before the gray matter scattered among them."

Does Serres refer to the longitudinal medullary bundles of the medulla oblongata, of the pyramids? If so, I have proved that the gray substance exists in the whole vertebral canal and annular protuberance, before the white substance, either in a liquid state, or possessing more or less consistence. Or does he mean the transverse bundles of the commissure of the cerebellum? The commissures rarely have any gray substance, but they originate from it, especially that of the cerebellum from the gray substance, covering the whole outer surface of the fibrous membrane of the cerebellum. Besides, both are swimming in gray substance from the first moment of their appearance.

5. "The white bundles of the optic nerves, that proceed to the corpora geniculata, exist long before the gray matter composing the latter."

The same remarks relative to the olivary bodies, are also true of these bundles and the corpora geniculata.

6. "The peduncles of the pineal gland are formed before this body; therefore, this body is not their ganglion, nor matrix."

The same error, the same gratuitous, arbitrary assertion; already refuted above.

The fact of cicatrization, which Serres invokes in his favor, proves absolutely nothing. Wounds cicatrize wherever there are vessels, and all nervous filaments from the brain, are accompanied with blood-vessels. Very often, particularly in young subjects, the transverse striæ of the great commissure, are intermixed with a substance of a dusky white, or yellowish tint, which leads us to presume, that they are not entirely devoid of gray substance.

All Serres's arguments against the priority of the non-fibrous substance, and in favor of that of the white, are reversed, therefore, by the most exact disposition of the nervous system in all classes of ani-

mals. Finally, we have arrived at Serres's favorite hypothesis. "Why," he asks, "have anatomists constantly persevered in attributing the origin of the white matter, to the gray? It is owing to a fundamental error laid down as a general principle, — to a preconceived idea, that the nervous system is developed from the centre to the circumference, and that the gray matter is formed before the white."

*Is the Nervous System formed from the Centre to the Circumference, or from the Circumference to the Centre?*

"It is strange," exclaims Serres, "how they have interpreted nature in precisely the inverse direction. They have supposed a course directly opposite to what she really pursues; ought we then to be astonished, that her laws have been misunderstood?" "From this eccentric course result the laws of organization; every organ being primitively double, its parts, at first isolated, proceed to meet one another and unite on the centre of the animal, forming organs which are called single."

Either the liver, spleen, and pancreas, are not organs, or Serres's assertion thus generalized, is false. It has always been a familiar fact, that animals are chiefly composed of two symmetrical halves, and I have proved, that the organs of animal life are all double. I do not recollect that these organs were ever called single; the os hyoides, the lower jaw, and sternum, have always been known to be composed of two halves. Now Serres believes, that the formation of membranes, bones, intestines, trunks, canals, &c., is eccentric! He invokes the judgment of the Royal Academy of Sciences. I much prefer facts to the judgments of Academies. But if the latter should have had the preference, where should we be, now that Academies have come into existence, with



their thousand reports, more especially too, if these reports had been received as law by the whole world !

According to this hypothesis, the fingers and toes are formed before the trunks of these extremities, and the latter, before the central parts of the body. In the same way, the leaves and flowers are formed before the branches ; the branches, before the stem ; and the stem, before the root ! But let us leave all these gratuitous suppositions and arbitrary assertions, and confine ourselves to the nervous system. Let us follow its progressive development, or origin.

At the first month, the swellings representing the head and spinal marrow, contain a thin transparent fluid. At the second month, this fluid becomes whitish and less diaphonous, and is gradually transformed into the spinal marrow and brain. By the seventh, or eighth week, the head and spine have lost their transparency. At this period, the vertebral column, the cranial bones, and the muscles of the back and neck, are not yet formed — another proof against the eccentric formation. A little later, this substance, once so transparent, and which is said to have no resemblance (no relation according to Jourdan) to the fluid that before occupied its place, becomes pulsataceous and of the consistence of the white of an egg. Its anterior face (exterior of Jourdan !) presents two cords, in which we can, as yet, discern no trace of fibrous structure. Recollect now, that they wish us to believe, that the fibrous substance exists previous to the non-fibrous substance ! On each side of the fourth ventricle, there rises from the spinal marrow, a thin narrow layer, which is folded inward and laid against that of the opposite side, but without uniting, or being blended into a single mass, with it. These two cords are the rudiments of the cerebellum, in front of which, we also perceive two other membranous productions, the rudiments of the tubercula quadrigemina. Then come two rounded protuberances, the optic thalami, in front of which, are placed

the rudiments of the corpora striata. From these two last eminences arise two membranous productions, recurring from without inward, and from before backward, which form the commencement of the hemispheres of the brain. Tiedemann has been unable to find, even at the ninth week, a trace of any other part of the encephalon, particularly of the annular protuberance of the commissures, of the corpus callosum, of the fornix and its dependences. He saw no nerve proceeding from the brain, or spinal marrow, the substance of which examined by a magnifying glass, presented no fibrous structure. During the second month, we recognize on the spinal marrow, seven cartilaginous nodules, but see nothing of ribs, nor limbs. At the eleventh week, we can scarcely discover any traces of the muscles of this region, which is still soft and whitish. At this time, we can only perceive the swellings of the origins of the nerves designed for the thoracic and pelvic limbs, and that of the medulla oblongata, as well as the cerebral and spinal nerves; quite large in proportion. The olivaria have not yet appeared, nor the annular protuberance. The hemispheres are still separated from each other longitudinally, by a deep fissure. In the cerebellum is no trace of processes, lobes, or laminæ. The anterior cerebral lobes are more developed than the middle and posterior, and in the anterior lobes, we observe the first origin of the commissure of the hemispheres. This origin of the great commissure from before backwards, evidently proves, that the commissure is not formed of fibres that come from the peduncles, the optic thalami, or corpora striata, because if it were, it ought to be formed from behind, forwards. At the fourth month, the spinal marrow has a fibrous texture on its anterior face, and sides. The posterior cords as yet, present, no fibres. The annular protuberance begins to appear. With the ciliary body there successively appear the ramifications of the cerebellum, and the annular protuberance is more and more enlarged,

just as the commissure of the hemispheres becomes longer, in proportion as the middle and posterior lobes are more developed. This development of the middle lobe also gives rise to the anterior commissure.

Thus, therefore, we have in the spinal marrow, at first, a transparent fluid, which is transformed into a gelatinous, non-fibrous substance, then the cords of a white fibrous substance, and finally, swellings which give origin to the spinal nerves. In the cerebellum, the middle, fundamental part, or as Serres calls it, the little thin tongue, exists before its lateral parts. In the brain, the tubercula quadrigemina, the peduncles, the optic thalami, the corpora striata, the anterior, middle, and posterior lobes of the hemispheres, are successively formed.

Is there any better proof, that the formation of the spinal marrow and brain takes place from the centre to the periphery? If the formation took the opposite course, the nerves would exist before the swellings; the swellings, before the fibrous substance; the fibrous cords, before the gelatinous, non-fibrous substance; the hemispheres of the brain would precede the corpora striata and thalami; the corpora striata and thalami would precede the peduncles, and all the parts would be anterior to the tubercula quadrigemina.

Since Serres maintains, that the brains of embryos at first resemble those of fishes, then reptiles, and finally, birds, it is equivalent to acknowledging that the most central parts are first formed; for, fishes and reptiles have only the rudimentary parts of the brain of the mammifera.

When Serres adduces, as an argument in favor of his hypothesis, the fact, that the right and left cords of the spinal marrow, and the hemispheres of the brain and cerebellum, are not at first united by commissures, he shows, that he does not understand the laws of the organization of the nervous system. I have demonstrated, that it is the nervous filaments, engendered in the non-fibrous substance of the surface of the cere-

bellum and brain, which, by converging towards the centre, form the annular protuberance, or commissure of the cerebellum, and the anterior commissure and septum lucidum, or commissures of a part of the middle lobes, and the corpus callosum, or great commissure of the hemispheres with the fornix. Now, the surface is last formed, consequently the unions or commissures must also be formed last.

Is his theory any better supported by the succession of the muscles? On the contrary, it furnishes new proofs of the centric formation. They all begin near the spinal column, the centre of all formation; first, the muscles of the vertebral grooves, then the intercostals, and finally, the muscles of the sternum. On the abdomen, the oblique on the sides come first, and afterwards, the secti and pyramidales which are farthest removed from the vertebral column, since, in embryos, the abdomen presents a vast opening. As the muscles proceed from the circumference, where they have been last formed, to meet their congeners, they shut up the abdomen and enclose the intestines.

Serres explains the monstrous formations of the nervous system, by saying that their evolution is arrested at the fundamental parts of reptiles, fishes, birds, or such or such of the mammifera. Now this explanation is intelligible only, on the supposition that the nervous system is formed from the centre to the circumference.

If it be true, that the lateral nerves of the trunk, head, and pelvis are first formed; that they exist independently of the spinal marrow; that they acquire all their development, while the cerebro-spinal axis is yet in a liquid state, &c., as Serres says, I have given the reason above, in speaking of the origin of the nerves from the mucous tissue of the muscles, skin, &c. But let us be on our guard, whenever an author is interested in misapprehending facts, in order to favor a published opinion!

Serres strongly insists on the anatomical truth, that



the development of the nervous system of the cerebellum and brain, is under the influence of the arterial system. But certainly, the arterial system is not developed from the circumference to the centre, and admitting that the venous system follows this course, we then embrace a proposition which I have already maintained in several places, viz., that there are nerves designed for the perception of outward impressions, and for their transmission to the sensorial organs. This disposition would be analogous to the returning, converging system, and the commissures of the brain and cerebellum, which I have demonstrated. Another order of nerves would be the nerves of reaction, equally analagous to the nervous system that diverges from the brain and cerebellum. Thus there would be nerves, formed from the centre to the circumference, and others, from the circumference to centre.

It is pretended, that the optic nerve is already formed before being connected with the brain. It needs a pretty strong authority to establish as a fact, a disposition, which, considering the precocious existence and development of the tubercula quadrigemina, presents no appearance of probability.

Serres himself says, p. 119: "The radiation from the central nucleus of the hemispheres of the cerebellum, is in relation to the divisions of the hemispheres. At the fourth month, the scarcely perceptible nucleus presents no apparent radiation; at the fifth month, one or two radiations are seen, and then there are two or three lobes; at the sixth month, a third radiation coincides with the fourth lobe; and when there are four radiations, there are also five lobes on the outer surface of the cerebellum." It results from these relations, that the development of the fissures and lobes, is immediately dependent on the central, medullary nucleus. The formation of the cerebellum, therefore, is from the centre to the circumference. And as this nucleus, which Serres, with some Germans, calls

the medullary nucleus, is, in reality, nothing but a nucleus of gray substance, he, in fact, admits, that the white, fibrous substance of the cerebellum takes its origin from the gray, non-fibrous substance.

After adding, that the development of the cerebellum is subjected to the successive increase of the calibre of the vertebral artery, he ventures to deduce, as a legitimate result, the following conclusion, the very contrary of which flows from his premises. "We see, from this description, that the cerebellum is developed from the circumference to the centre, and not from the centre to the circumference, as Tiedemann thinks." Serres's whole work swarms with such conclusions, diametrically opposed to his premises, and solely designed to take by surprise, the credulity of inattentive or ignorant readers.

Serres himself cites observations, that most evidently prove, that even the formation of the limbs is dependent on the ganglions of the spinal marrow. In two human embryos without lower extremities, the lower part of the spinal marrow was not swelled. In two cats and one dog, destitute of the hind feet, the inferior swelling of the spinal marrow was wanting. In a human embryo destitute of the upper limbs, the spinal marrow was not swelled in the cervical region, and a cow affected with the same monstrosity, presented the same disposition. If the formation commenced at the circumference, the swellings would not be necessary, while it is altogether different on the supposition of central formation. The ganglions not existing, in consequence of a defective organization, the nerves that control the limbs, could not arise.

On Serres's hypothesis, the organization of the nervous system would be subject to one law, in one place, and to another, in another place. It is evident, that the pyramids go on enlarging, till, after their decussation, they are found on the anterior or inferior surface of the medulla oblongata; that in their passage through the annular protuberance, they form large, nervous

bundles, or the peduncles, which are again enlarged in the thalami and corpora striata to such a degree, as to produce a great part of the expansion of the white substance of the hemispheres. It is equally evident, that the olfactory nerve increases during its whole course, until it reaches its bulb, where it receives a fresh increase, preparatory to its expansion in the nose. It is evident, that the optic nerve, after taking the first demonstrable origin in the anterior pair of tubercles, increases in mass, in the inner and outer corpora geniculata, in the peduncles, in the gray layer situated behind and upon its junction, and even in its course thence, to its insertion in the bulb of the eye. It is demonstrated in the same way, that all the nerves enlarge or become conical, in proportion to their distance from their origin, being always accompanied with blood-vessels and gray substance. This successive increase, is perfectly explained, on the theory of the formation from the centre to the circumference, by the fresh filaments, which are added in the new beds of gray substance. But, admitting the formation from the circumference to the centre, the nerves should go on diminishing, notwithstanding the different masses of gray substance they encounter in their course. Finally, how are we to explain the existence of the diaphanous, liquid substance, successively transformed into gray substance, in the spine, and the gray substance between the exterior and posterior cords, of the marrow, long before the existence of nerves?

If the transmission of impressions to the brain, proves any thing in favor of the peripheric origin of the nerves of sensation, the propagation of irritation and motion, towards the extremities, when we irritate the nerves of motion, is a proof in favor of their central origin.

I therefore declare Serres's hypothesis, taken generally, to be contrary to the laws of formation in the vegetable, as well as animal kingdom. I declare it to be a most extravagant hypothesis, designedly adopted because it afforded a ground for finding fault with, and

utterly depreciating every thing done by anatomists and physiologists, before Serres. I say *designedly adopted*, because it was not in Serres's researches, but in the inflamed imaginations of the transcendental philosophers of Germany, that this fiction took its rise. See the language of Burdach, in his work, printed in 1819. "The nervous system exerts its action in a double direction, from without inwards, and from within outwards. The former will first occupy our attention. Every physiological consideration of the nervous system must begin at the periphery, and proceed to the centre, for it is necessary that the exterior should be first formed, in order that it may be able to act towards the interior. In the embryo, the veins are formed before the arteries, and the upper half of the intestines is developed, sooner than the lower half. At birth, inspiration occurs before expiration, and through life, nutrition begins by the action of the absorbents and veins. The action of a nerve from the periphery to the centre, is the primitive and essential action. The nerve acts in a purely dynamic manner; it receives impressions at its periphery, and transmits them from all sides to the common centres, where they meet and form a unity."\* Here begins such a mystical and absurd rhapsody on the universal soul of the world, on materiality transformed into spirituality, and spirituality transformed into materiality, &c. &c., that it is impossible for me to discover in it, any sense whatever, or to continue the translation. But this passage is sufficient to show, where Serres borrowed his grand conception.

In the mean time, however, Burdach modifies his notions. "Sensibility does not originate from a single point, thence to be spread over other parts; it is manifested in every point of the nervous system, so long as each one preserves its reciprocal action with all the rest. Considering its double reciprocity, we cannot

---

\* Vom Bau und Leben des Gehirus, p. 41.



say of a nerve, that it arises here, and terminates there. We can only say, it extends between its central and peripheric points. Its origin, in respect to sensation, is at the circumference ; in respect to reaction, at the centre. Though, in neurography, it would be more convenient to derive the nerves from the brain and spinal marrow, it better expresses the physiology of the subject, to start from their peripheric extremity, since sensation precedes motion, and impression, reaction." Page 60.

Burdach adds, p. 216: "In following the nervous system from its peripheric extremity towards its central points, I may seem to be seeking for singularity. It will be said that I have reversed well-known things to give them an appearance of novelty. My manner of considering the nervous system of the trunk, is founded on the general principle, that *unity* is the essence of sensibility, and that, to comprehend the *origin the genesis of the soul*, we must proceed from the circumference, and stop at the centre.... The nervous system of the trunk is a network, and in order that intuition should not stop in this network, we must seek for the points, where the commencement is subject to no doubt. But where could this take place, if not in the peripheric extremities? It is only by starting from these, that we uninterruptedly acquire a general knowledge. But if we begin at a plexus, the cœliac for example, it is a matter of chance altogether, and we can give no reason why we should not rather begin with the cardiac plexus or the plexus of soft nerves." And thus he heaps up, nonsense upon nonsense. I shall not attempt to expose all the false reasoning in the transcendant declamations and magnetic reveries of Burdach. It is enough for me, to have shown the noble origin of Serres's favorite hypothesis.

If it were the result of observation, there would be no need of hedging it about with so many arbitrary and contradictory propositions, many of which I might easily have destroyed. I will call the reader's attention to a few of them.

It is false, to say that the nerves proceed to the ganglions, instead of saying that they arise, or depart from them. It is, as if we should say, that the branches proceed to the trunk, instead of growing from it. While the substance of the cotyledons, the farinaceous, starchy substance of the seed, is still liquid and transparent, the germ is already formed, drawing its nourishment and its elements from this substance. As soon as the germ is developed by means of external influences, it is nourished by this same substance, which is used in the same degree that the germ with its radicles is buried in the earth, and its plumule ascends into the air. The starchy substance being exhausted, the shrunken cotyledon falls, and the plant is nourished from the soil and atmosphere. How does nature manage to form a tree, but by first accumulating at various points the substance called *cambium*, deposited between the bark and wood all along the trunk and branches. This cambium first forms a swelling, whence arise new radicles that are united below to the stem, and also a new plumule appearing under the form of an eye or bud, and which is developed into leaves, branches, flowers, &c. Thus, by one swelling to another, and one new formation to another, the tree enlarges and obtains its entire development, its head. Notwithstanding all these formations from the centre to the periphery, there is not the less a retrograde action established in the branches and leaves. The leaves, composed of veins and parenchyma, absorb the nutritious substances of the atmosphere, which are distributed to every part of the plant. Here then are the same laws of formation which we see in the nervous system.

It is false, that Cuvier exploded the opinion, that the olfactory nerve takes its origin from the corpora striata. Before the publication of our memoir, Cuvier still derived the olfactory nerve from the corpora striata, and the optic, from the thalami. He even maintained with Jacobson, that the olfactory nerve, extremely

small, exists in the Cetacea, so that, since the cetacea have the corpora striata, he could not infer from this fact, as Serres says he did, that the olfactory nerve does not originate from them.

It is false, that in man, the external root of the olfactory nerve, is inserted as Serres expresses it, p. 291, by one of its bundles, on the outer rays of the anterior commissure. This commissure has no connexion at all with the olfactory nerve; for, it begins with the converging bundles of the middle lobes, traverses the anterior-inferior part of the corpora striata, without giving to, or receiving a single filament or bundle from the olfactory nerve.

It is false, that the olfactory nerves and the fifth pair increase in volume as that of the brain decreases, as Serres says. If it were so, the horse, ox, &c. ought to have a brain much smaller than the tiger and lion; the sheep's should be smaller than the cat's; the mole's much smaller than the rat's, &c. In one word, all that Serres parades so pompously about the proportions of the different parts of the nervous system, varies in respect to individuals, age, and variety of species. The only determinate proportions are between the integrant parts of a special division. For example, there is a proportion between the restiform bodies of the cerebellum, and the annular protuberance; between the pyramids, peduncles, optic thalami, corpora striata, and hemispheres.

It is false, that in the olivaria, the white matter is developed before the gray. If, as Serres says, p. 564, the gray substance is not developed in birds, fishes, and reptiles, it is because the olivaria and the nervous bundles that arise from them, do not exist in these animals.

In general, every thing that Serres has advanced, to prove that the white substance is formed before the gray, is arbitrary, contrary to the established laws of the organization of the nervous system, and, considering his disposition and intention, I venture to say, contrary to his own conviction, at least, without any positive proof drawn from nature itself.

It would require a work as large as Serres's, to refute in detail, all his erroneous assertions, without mentioning what he has borrowed, without acknowledgment, from Oken, Carus, Tiedemann, Burdach, Meckel, Treviranus, Arsaky, and finally from ourselves.

Let us look at the extracts inserted in the *Archives generales de Medicine*. The writer has faithfully copied Serres's propositions, without suspecting their error. He particularly insists on the following: "The question of the preëxistence of the different parts of the nervous system, is embraced in that of the preëxistence of its different arteries, and the order of their formation indicates the course of the development of the encephalon and spinal marrow."

This is very much as if I should say, the preëxistence of the different parts of the tree, is embraced in that of the preëxistence of the bark, and the order of its formation indicates the course of the development of the branches, &c. Undoubtedly, before an organ begins to exist, the parts which are essential to it do not exist. We may say with just as much reason, that the existence of the arteries is dependent on the existence of this or that organ.

As Serres and his reviewer make the arteries and nervous system, proceed together and in the same order, he seems to have forgotten to prove, that the formation of the arteries is also from the periphery to the centre.

### *Conclusion.*

Thus have I brought forward and refuted all the most important objections, that modern anatomists and physiologists have urged against the reality of my anatomical and physiological discoveries. I have proved;

That the fate of the physiology of the brain is in-



dependent of the truth or falsity of my assertions relative to the laws of the organization of the nervous system, in general, and of the brain in particular, just as the knowledge of the functions of a sense is independent of the knowledge of the structure of its apparatus;

That the pulpy, non-fibrous, gray, cortical substance, is anterior to the white, fibrous substance, which takes its origin from the former;

That the different nervous apparatus, and the different parts of the brain, are each appropriated to a particular specific function;

That one nerve or cerebral part can never take the place, or function of another nerve, or cerebral part;

That it is absurd and contrary to the clearest indications of nature, to maintain, that the smallest part whatever of the brain or nervous system, may be sufficient for the different functions belonging to the different nerves and cerebral parts;

That it is impossible for the different parts, that constitute successively the brains of the lower animals, to form, in the human brain, with its peculiar cerebral parts, a single organ, a centralization of all the organs into one unique, indivisible organ, performing, as a whole, the most varied and essentially different function;

That the notions about the *unity* and *homogeneousness* of all the parts of the nervous system, were begotten by the speculative philosophy of Germany;

That the partisans of this chimera, while proclaiming this unity and homogeneousness, prove, themselves, the universal isolation, independence, and specific difference of the different parts of the nervous system, and the special nature of their functions;

That the experimental physiologists, in order to obtain pure and exact results, require the isolation of the parts on which they experiment, as an indispensable condition, and that, while they proclaim the unity and homogeneousness of all these parts, they

consider the isolation of lesion and mutilation, and consequently, also of the result, as impossible, since, they admit, that a part being wounded or irritated, wounds or irritates all the rest.

That it is in fact impossible to prevent the reciprocal influence of the different parts of the nervous system, or to isolate irritations, lesions, and mutilations, and obtain specific, isolated results;

That it is impossible to perform exactly the same operation, or experiment, a second time, and that not only each different experimenter, but the same man, in each new experiment, must necessarily obtain different results;

That it is absurd to think of applying the vague, arbitrary, varying and perhaps, poorly observed results of experiments on hens, pigeons, and rabbits, to the moral and intellectual faculties of man;

That it is repugnant to the organic laws, to lay down as a general law, the formation of the nervous system from the periphery to the centre, and that this extravagance is a spoilt child of the speculative philosophy of the mystic soil of Germany, &c. &c. &c.

In all my demonstrations and refutations, I do not so much rely on my own reflections, as on the confessions and imprudent falsehoods with which the works of my opponents are filled.

*Memoires du Docteur F. AUTOMARCHI, ou les derniers momens de Napoleon, T. II, p. 29.*

Here again are some passages directed against my discoveries, and which are interesting, more from the source whence they come, than from any intrinsic merit.

“Lady Holland had sent a box of books, in which was also contained a bust in plaster, the head of which was covered with divisions and figures, according to the craniological system of Dr. Gall. ‘There, doctor,’

said Napoleon, 'that lies in your province ; take and study it, and you shall then give me an account of it. I should be glad to know what Gall would say of me if he felt my head.' I immediately set to work ; but the divisions were inexact, and the figures misplaced, and I had not been able to put them to rights, when Napoleon sent for me. I went, and found him in the midst of a mass of scattered volumes, reading Polybius. He said nothing to me at first, and continued to run over the pages of the work he held in his hand ; he then threw it down, came to me, and taking me by the ears, and looking me steadily in the face, 'Well ! *dottoraccio di capo Corso*, you have seen the bust ? — Yes, sire. — Meditated the system of Gall ? — Very nearly. — Comprehended it ? — I think so. — You are able to give an account of it ? — Your majesty shall judge. — To know my tastes, and to appreciate my faculties by examining my head ? — Even without touching it (he began to laugh). — You are quite up to it ? — Yes, sire. — Very well, we shall talk about it when we have nothing better to do. It is a *pis-aller*, which is just as good as any other ; and it is sometimes amusing to notice to what extent folly can be carried.' He now walked up and down, and then asked, 'What did Mascagni think of these German reveries ? Come, tell me frankly, as if you were talking to one of your brethren. — Mascagni liked very much the manner in which Gall and Spurzheim develop and point out the different parts of the brain ; he himself adopted their method, and regarded it as eminently fitted for discovering the structure of this interesting viscus. As to the pretended power of judging from protuberances, of the vices, tastes, and virtues of men, he regarded it as an ingenious fable, which might seduce the *gens du monde*, but could not withstand the scrutiny of the anatomist. — That was like a wise man ; a man who knows how to appreciate the merit of a conception, and to isolate it from the falsehood with which charlatanism would overcharge it ;

I regret not having known him. Corvisart was a great partisan of Gall; he praised him, protected him, and left no stone unturned (*fit l'impossible*) to push him on to me, but there was no sympathy between us. Lavater, Cagliostro, Mesmer, have never been to my mind; I felt, I cannot tell how much aversion for them, and I took care not to admit any one, who kept them among us. All these gentlemen are adroit, speak well, excite that fondness for the marvellous, which the vulgar experience, and give an appearance of truth to theories the most false and unfounded. Nature does not reveal herself by external forms. She hides and does not expose her secrets. To pretend to seize and to penetrate human character by so slight an index, is the part of a dupe or of an impostor; and what else is that crowd with marvellous inspirations, which pululates in the bosom of all great capitals? The only way of knowing our fellow-creatures is to see them, to associate with them frequently, and to submit them to proof. We must study them long, if we wish not to be mistaken; we must judge them by their actions; and even this rule is not infallible, and must be restricted to the moment when they act; for we almost never obey our own character; we yield to transports, we are carried away by passion; such are our vices and virtues, our perversity and our heroism. This is my opinion, and this has long been my guide. It is not that I pretend to exclude the influence of natural dispositions and education; I think, on the contrary, that it is immense; but beyond that, all is system, all is nonsense.' "

Already, in the *Mémorial de Saint Hélène*, by the Count Las Casas, the following passage had appeared:—

"I have greatly contributed to put down Gall; Corvisart was his great follower; he and his fellows had a strong leaning to Materialism; it would increase their science and their domain. But nature is not so poor; if she was rude enough to announce her meaning by external forms, we should soon attain our ends,



and we should be more learned. Her secrets are finer, more delicate, and more fugitive; — hitherto they have escaped every one. A little hunchback is a great genius; a tall and handsome man is often a great ninny; a large head with a big brain, sometimes has not an idea, while a little brain is often in possession of vast intelligence. And yet, think of the imbecility of Gall; he attributes to certain bumps, dispositions and crimes which are not in nature, and which take their rise from the conventional arrangements of society. What would become of the bump of thieving if there was no property? of the bump of drunkenness, if no fermented liquors existed? of that of ambition, if man did not live in society?"

Sovereigns are always deceived when they ask advice from the ignorant, the jealous, the envious, the timid, or from those who, from age, are no longer accessible to new opinions. Napoleon acquired his first notions of the value of my discoveries, during his first journey to Germany. A certain metaphysical jurisconsult, E——, at Leipzig, told him, that the workings of the soul were too mysterious to leave any external mark. And, accordingly, in an answer to the report of the Institute, I had this fact in view when I terminated a passage by these words:— "And the metaphysician can no longer say, in order to preserve his right of losing himself in a sea of speculation, that the operations of the mind are too carefully concealed, to admit of any possibility of discovering their material conditions or organs." At his return to Paris he scolded sharply (*tança vertement*) those members of the Institute, who had shown themselves enthusiastic about my new demonstrations. This was the thunder of Jupiter overthrowing the pigmies. Immediately, my discoveries became nothing but reveries, charlatanism, and absurdities; and the journals were used as instruments for throwing ridicule—an all-powerful weapon in France — on the self-constituted bumps. Napoleon was made to believe that "Gall's

imbecility" had led him to imagine a bump or organ for drunkenness; and in this case I certainly should have merited this laconic epithet. "*He attributes to certain bumps, dispositions and crimes, which are not in nature, but arise from the conventional arrangements of society.*" And whence does society arise? If Napoleon had read all that I have said in this work on society, on the social life of man and animals, and on the pretended artificial qualities and faculties, he would have acquired profounder views of all these objects. In regard to my doctrines, the ideas and prejudices of Napoleon differ in no respect from those of the vulgar. *What would become of the bump of thieving, if there was no property? of that of ambition, if there was no society?* What would become of the eye if there was no light?—but light exists. What would become of taste and smell, if there were no odorous particles, and no savory qualities?—but these qualities and particles exist. What would become of the propensity to propagation, if there were not two sexes?—but two sexes exist. What would become of the love of offspring and of children, if offspring and children did not exist?—but they do exist. What would become of the carnivorous instinct, if animals did not exist to be devoured?—but these animals do exist. In the same way, property and society exist in nature, as I have already proved in treating of these subjects. I conclude, then, that neither Napoleon nor his advisers had penetrated sufficiently far into the nature of things, to perceive that the organization of man and animals, is calculated for and adapted to the existences of the external world, and that we have no connexion with external objects, except in so far as we have received organs which are in relation and in harmony with these same objects; and that, whenever any given organ is wanting, the thing in relation with that organ, has no longer an existence for such an individual.

"If Napoleon wished to destroy the tendency to

materialism in the way he understood it, he ought to have begun by prohibiting the study, not only of the anatomy and physiology of the brain, but also that of natural philosophy, natural history, of the influence of nourishment, of the seasons, climate, and temperament, upon the character of man, &c. &c. And after having ordained it to be taught, that the eyes and ears were not necessary for seeing and hearing, nor the brain for thinking, he ought to have employed three hundred thousand bayonets, and as many cannon, to render the functions of the mind absolutely independent of matter. This victory once promulgated and acknowledged, he would easily have put down the anatomy and physiology taught by a feeble son of Esculapius. But coffee is swallowed, potatoes are eaten, and vaccination is performed, without regard to the outcries of some physicians against them; the blood circulates in spite of Gassendi; the earth revolves in despite of the anathema of the Pope; animals are no longer automata, notwithstanding the decrees of the Sorbonne, and the anatomy and physiology of the brain, discovered by the German doctor, subsist and will subsist in spite of the efforts of Napoleon, and of his imitators, and of all their auxiliary forces.

M. Antommarchi had but a very meagre and superficial knowledge of the physiology of the brain, and was not at all prepared to rectify the prejudices of his august patient. After the fashion of superficial and officious ladies, a plaster-bust, with the organs marked on it, was sent like a play-thing to Napoleon. But it was quite above an ordinary conception to send him my work, or to ask him to become acquainted with my own ideas. In this way the emperor and his physician continued, in the midst of their amusement, to be ignorant of the principles and tendency of the physiology of the brain. M. Antommarchi amuses his readers with a vague enumeration of the organs of which he perceived the indications in Napoleon. He found the organs of Dissimulation and of Conquest,

which last is apparently my organ of the Carnivorous Instinct; the organ of Benevolence; that of Imagination, which is not to be found in my work; and the organs of Ambition, of Individuality, of Locality, of Calculation, of Comparison, of Causality, or the inductive spirit.

Let us now give the final result of our observations, — the true theory of the moral qualities and intellectual faculties of man.

---

## PHILOSOPHICAL CONSIDERATIONS.

ON THE MORAL QUALITIES AND INTELLECTUAL FACULTIES OF  
MAN.

### *Philosophy of Man.*

IN the course of this work, I have often said that my predecessors never succeeded in making discoveries on the functions of the brain in general, nor of its particular parts, because they suffered themselves to be guided by a false philosophy of the human qualities and faculties. This censure is applicable, not only to the doctrines of this or that philosopher, but is deserved equally by all. I have promised to substantiate the charge, and have already done so, in several places, particularly in vol. i. Now that the reader is familiar with the real fundamental powers, I consider him sufficiently prepared to follow me step by step in the following considerations.

I shall not introduce the systems of my predecessors, in order to refute them by a comparison with mine, for it would be idle to fight with darkness. It will be sufficient for me to bring in light. I shall here assemble some ideas that are scattered over this work, and



shall show the reader the consequences, that necessarily result from them, and which he may already have inferred for himself.

*Of the Difference between the Fundamental Powers and their General Attributes.*

The term, *fundamental quality or faculty*, expresses what is proper or peculiar to the powers, — that which constitutes their essence, their nature. The term, *general attribute*, on the contrary, expresses what these fundamental qualities and faculties have in common.

I have proved, that all the qualities and faculties of which I have treated, and whose organs, I have discovered, are primitive fundamental powers. But none of my predecessors were acquainted with these powers, which are exclusively the functions of the particular cerebral organs. No one ever sought for an organ of the instinct of propagation and of the love of offspring, of the carnivorous instinct, of benevolence, of music, of calculation, &c., consequently, none whatever were discovered. They confined themselves to those phenomena that are common to the fundamental powers, viz., their general attributes. They sought for the organs of attention, perception, memory, judgment, imagination, appetite; of instinct, affections, and passions. Reason and will were with them, the pure powers of the mind, independent of every organic condition. I shall now proceed to prove that attention, memory, judgment, and imagination, are only attributes common to the fundamental qualities and faculties, not the fundamental qualities and faculties themselves.

The better to connect the philosophy of man with natural history generally, let us glance at the world of nature, and examine the methods that naturalists have always adopted, for studying its details. They

have begun by trying to ascertain the general attributes of all bodies, and have discovered that extent, impenetrability, attraction, and repulsion, belong to all material things,—to light, as well as to metals, to the integrant parts of a plant, as well as those of a man. But if natural philosophers had contented themselves with the knowledge of these general properties, what should we now know of their science? Could we distinguish, by any specific character, the most dissimilar substances, such as earth, water, air, metals, light, plants, animals? for, they are all endowed with extent, impenetrability, attraction, and repulsion. It was necessary to look for particular characters, and to distinguish bodies into classes, and, it is by means of these characters, we distinguish earth from water, water from metals, and plants from animals, and thus a great step is made. But, if they had confined themselves to the properties common to all metals, to all plants, &c., the natural sciences would not now be in existence. The object is, to distinguish one metal from another, one plant from another, &c., that is, to find the properties that distinguish a certain class of metals, plants, and animals. They have talked of terrestrial animals, and aquatic animals, of insects, fishes, reptiles, amphibia, and mammifera; and the more they have abandoned those general expressions, the more they have concerned their minds with particular properties. They have established subdivisions; divided mammifera into frugivorous and carnivorous; the carnivorous, they have subdivided into cheiroptera, galeoptheci, insectivora, carnivora, &c., and the more they have succeeded in establishing characters, that are applicable only to particular genera and varieties, the more precise, clear, individual, and consequently useful, does the knowledge of the naturalist become.

Why is it, that it is precisely those who are so proud of the metaphysical spirit of their inquiries, who publish the results of their speculations with as

much assurance, as if they were demonstrated truths, that reject this method, and think their notions the more precise, the more general they are; or in other words, the less applicable they are, to particular cases and individual facts, and consequently, the less practicable? It is probably because the methods of these philosophers has required no observation, that it leaves the field entirely open to sophisms, as well as to sound reasoning, and that in this way, each metaphysician can easily erect a system of his own, and become the chief of a sect. But it necessarily results, that these doctrines have nothing in common with the real world; that they all are stamped with the peculiar turn of mind and capacity of their inventors; that they differ, as much as the minds of those that conceived them. In entering upon this subject, I shall begin to show the faults of the existing philosophy, relative to the higher functions of animal life, or the moral and intellectual powers.

The most general property, that which is common to all the nerves, is sensibility, or power of perceiving irritations, stimuli, &c., or to use another term, sensations. Are there not philosophers, even in our days, that admit only this single, solitary power in the animal kingdom? that derive from it, the voluntary movements, the functions of the five senses, and all the moral qualities, as well as intellectual faculties? To think, say the ideologists, is to feel; to remember, judge, and all that, is only to feel. All the faculties of the understanding are included in the faculty of feeling, and the difference of motion alone, according to M. Destut-Tracy, explains all the different modes of feeling.

There can be no doubt that sensibility bears a part in all these phenomena, in the same way that all bodies are endued with impenetrability and extent. But what does physiology gain by knowing that the nerves are sensible? Does this throw any light on the true cause, on the material conditions of specific

functions, on voluntary motion, on the functions of the five senses, on the different moral qualities and intellectual faculties? Would we listen to a naturalist who should tell us that all beings are only bodies differently modified? that insects, fishes, amphibia, and mammifera, are only animals differently modified? According to this system, the study of natural history, would be an easy work. But how do the modifications of these sensations arise? How are these different motions effected? How does the general faculty of feeling become the faculty of voluntary motion, of seeing, hearing, and feeling? How does it become this or that intellectual faculty, or moral quality? Could not the Author of all that exists, create a particular family of nerves for voluntary motion, another for the functions of the five senses, and another still, for each function of the qualities and faculties? Was it not necessary that the nerves of each sense should have their peculiar origin, structure, and function? True indeed, there is sensation in all these phenomena, but it is something more than sensation modified in different ways. It is sensation essentially different, in each different case — as essentially different, as the plant is from the animal, the mammifera from the bird. The end of physiological researches, is, to ascertain the difference between sensations, and to discover the different organs which nature has created in the system, for producing so many essentially different sensations, from the most simple perception of a stimulus, even to the most elevated conceptions. It is clear, therefore, that this mode of generalization, cannot reach objects as they exist in nature. We shall see that it is the same with the other faculties, which the ideologists have recognised as the only intellectual faculties, and that they equally, are only common attributes of all the fundamental faculties.



*Of Perception, Recollection, Memory, Judgment,  
Imagination, and Attention.*

To prove that the faculties of the mind, hitherto admitted by philosophers as realities, are only the attributes of each fundamental faculty, I shall content myself with some examples which, it will be easy for the reader to apply himself.

I class among the number of fundamental faculties, the sense of locality, the sense of tones, the sense of numbers, and the sense of arts. Now, he that is endowed with the sense of locality, the sense of tones, &c., necessarily has the faculty of perceiving the relations of space, and of tones, and the same may be said of the sense of numbers. A person endowed with the sense of locality, remembers the relations of space, and the places he has seen, when he meets them again. He even enjoys the faculty of presenting to his mind, by its own inward power, the relations of places which he has seen, without its being necessary for the outward impression to be repeated; that is, he is endowed with the memory of places. He too who remembers having heard certain music, has a musical memory; and he who can reproduce, by an inward power alone, certain music which he has heard, and without needing a renewal of the outward impression, has also a musical memory. In the same way, the arithmetician and mechanic have a memory of the relations of numbers, and of the arrangement of a machine.

To these four fundamental faculties, therefore, belong four faculties of perception and four of memory. The faculty of perception and that of memory are common to these four, and to all the fundamental faculties in general. None of these common attributes constitutes a fundamental power. An animal may have the faculties of perception and memory, relative to the sense of tones and the sense of localities, for

example, without having the faculty of perception, or memory, in regard to the sense of numbers or that of mechanics, because he wants these two fundamental faculties. When the fundamental faculty is wanting, the attributes must be also. The dog, endowed to such an astonishing degree, with the sense of locality, has neither the faculty of perception, nor that of memory, for the relations of tones, for the structure of a machine, or for moral and religious thoughts. The beaver which is an admirable architect, has neither perception nor memory of the relations of tones and colors, and for the reason, again, that he is destitute of two fundamental faculties, the sense of tones and that of colors.

From what has been said, it is very evident, that perception and memory are only attributes common to the fundamental faculties, but not the fundamental faculties themselves; and consequently, that they can have no proper organs. They therefore, that seek for such organs, will never succeed in finding them. In fact, if the perceptive faculty were a fundamental power, and had its peculiar organ, the man or brute endowed with it for one thing, would be so for all things. But natural history proves the contrary in the different species of brutes, and in partially imbecile men; and it is precisely the same with memory. Neither man nor brute can remember objects, which they have no capacity to receive.

If perception and memory were fundamental forces, there would be no reason why they should be manifested so very differently, according as they are exercised on different objects. There would be no reason why the same, and, in fact, every individual, should not learn geography, music, mechanics, and arithmetic, with equal facility, since their memory would be equally faithful for all these things. But where is the man, who, after the greatest possible application, should succeed with equal ease, in these different branches of knowledge, and not evince,

however astonishing his capacious memory, in certain respects, might be, an extremely small endowment of the same faculties, in all other respects ?

All that has been said, relative to the common attributes of all the fundamental faculties, is also applicable to judgment and imagination. Whoever is eminently endowed with the sense of locality, easily recognises the relations of places, and has a good judgment of the relations of space. Whoever is endowed with a very active sense of tones, perceives concords, readily judges of the correctness, or incorrectness of the relations of tones, and finally, has a good judgment of the relations of tones. In the same manner, whoever has the sense of numbers, has a good judgment of the relations of numbers ; the sense of arts, a good judgment of works of art. When, however, the fundamental faculty fails, the judgment relative to the objects of this fundamental faculty, must necessarily fail also.

I apply the term, imagination, to the action of whatever faculty it may be, that takes place independently of the external world ; it is the creative power of each fundamental faculty. The imagination of the sense of locality creates landscapes ; that of the sense of tones, music ; that of the sense of numbers, problems ; and that of the mechanician, machines. This explains why a man's judgment may be prompt and correct, relative to certain subjects, while he is almost imbecile in regard to others ; why he may manifest the most rich and brilliant imagination, relative to a certain class of subjects, while he is cold and barren, upon every other. It is impossible for an animal to possess judgment and imagination respecting subjects, for which nature has refused the fundamental faculty. What judgment of music or the relations of numbers, could be pronounced by the fox, which, nevertheless, is an admirable judge of the means of escaping from snares and surprising his prey ; or by the beaver, which judges of the rise and fall of the

stream, and accommodates his structure to these circumstances? The dog, by virtue of his imagination, dreams, that he is engaged in the chase, or, that he has lost his way, and wanders through the whole city in search of his master's house. But will you believe, that he dreams of mechanics, pictures, calculations, architecture, and combinations of philosophical ideas? Judgment and imagination, therefore, are not fundamental powers, but only attributes common to all the fundamental faculties. Is it a matter of astonishment, then, that they have sought in vain for their organs?

I cannot conceive, how it ever entered the heads of certain philosophers to maintain, that attention is the source of all our faculties and propensities. I admit, for a moment, that attention is exerted in every thing done by man or brute; but it must proceed from a fundamental power,—it never can be the source of any fundamental power whatever. A partially imbecile person may give the most untiring attention to every thing relative to mimicry, to order, and to the sexual functions, but none whatever to sentiments and thoughts of a different order. The educated and thinking man is very soon fatigued, when fixing his attention on subjects that are out of his sphere, while it is mere sport for him, to give unwearied attention to subjects that belong to his province. He, who is highly endowed with a sense of locality, devotes his attention, without an effort, to the relations of space; while, if his sense of tones be feeble, he will hardly be aware of the performance of the most enchanting music. Vaucanson, while a child, gave his attention to the wheels of a time-piece, on which a musician, or gray-haired poet would have scorned to give a single look. The coquette, whose whole attention is engrossed by the milliner's shop, would pass by the most valuable collection of natural history, or the richest library, with perfect indifference. Attention, therefore, is only an attribute of each fundamental faculty, and when this is wanting, attention to the



objects of this faculty, is impossible. Try to fix on numbers, colors, or a poem, the attention of a falcon, which keeps his eye on the lark; of the horse, whose ear is trained to obey the orders of his keeper; of my starling, which forgets to eat its favorite meal of worms, when I am whistling it a tune.

The reader, I think, from what has been said, must be convinced that the intellectual power, with all its subdivisions, such as perception, memory, judgment, and imagination, are not fundamental faculties, but only their general attributes. As the fundamental faculties are not known; as the organs of their attributes alone, have been sought for, I have good reason for saying, that a false philosophy has impeded the progress of the discovery of the functions of the brain, and its integrant parts.

In recapitulation then, we observe, that wherever there exists a fundamental faculty, a particular and definite intellectual power, there also necessarily exists a power of perception relative to this faculty. Whenever this faculty is actively exercised upon its appropriate objects, there is attention. Whenever the ideas or traces, which the impressions of these objects have left on the brain, are renewed, either in the presence, or absence of these same objects, there is passive memory, reminiscence. If this same renewal of impressions is done by a deliberate, voluntary act of the organs, there is active memory. Whenever an organ or fundamental faculty, compasses and judges the relations of analogous and different things, there is judgment. A series of comparisons and judgments, constitute reasoning. Whenever an organ, or fundamental power creates, by its own inherent energy, without the concurrence of the external world, objects relative to its function; when the organ, by its own activity, discovers the laws of objects placed in relation with it in the external world, there is imagination, invention, genius. Admitting, for a moment, that perception, attention, memory, reminiscence, comparison, judg-

ment, reasoning, imagination, invention, and genius, considered either as gradations of the different degrees of the same faculty, or, as particular states of this same faculty, it still remains certain, that all the fundamental faculties, that have been demonstrated as such in Vols. III, IV, and V, are, or may be, endowed with perception, attention, memory, judgment, imagination, and consequently must be recognised as intellectual and fundamental faculties; while the pretended mental faculties of my predecessors, are only common attributes. Here, then, is an entirely new philosophy of the intellectual powers, founded on the natural history of the different modes of human intelligence. Let us apply the same operation, to the appetites, faculties, or qualities.

*Of the Moral Qualities, the Appetitive Faculty, the Appetites, Propensities, and Passions.*

The appetitive faculty, and its subdivisions, have been considered as proper faculties, in the same manner as the intellectual faculty and its subdivisions, and their organs have also been sought for. But, as they have never succeeded in finding them, they have concluded, from all these fruitless researches, that the operations of the mind are much too secret, for it to be possible to follow their traces. The discovery of these organs was in fact impossible; for, desires, propensities, passions, are, in fact, only different degrees of the activity of some fundamental power, whether intellectual or appetitive. A desire, propensity, or passion, supposes, therefore, a fundamental quality or faculty, and we can have no desire, propensity, or passion, but in regard to objects, for which we are endowed with a primitive or fundamental power. Let me explain. When a person is endowed with a sense of poetry, of construction, of locality, in a feeble degree only, there will not be a well-marked fondness for these objects.

When, on the contrary, the organs of these fundamental powers act with more energy, the person finds a pleasure in the exercise of the functions that relate to it; he has a propensity for these objects. When the action of these organs is still more energetic, the person feels a necessity for occupying his mind with these objects, — he has a *desire* for such occupation. Finally, if the action of these organs preponderates over the rest, he is drawn towards these objects; he feels his happiness in them; he feels opposed and unhappy, when he cannot follow the bent of his propensity; he has a *passion* for these objects. In the same manner, certain persons have a passion for music, poetry, architecture, travelling, &c.

As the fundamental powers are developed in different proportions in each individual, a person may have a violent passion for certain things, music, for instance, and be very indifferent to others, mathematics for example. If there were an organ of the passions, those endowed with it, should have an equal passion for every object. The same must be the case with the desires and propensities, if they are proper faculties or appetites, and also with the most exalted intellectual faculties. They, whose organ of comparative sagacity is very active, have a taste, a passion for comparisons and apologues. A great activity of the organ of metaphysics, immerses the thinker in the world of ideas. He sees no truth, and feels no pleasure, but in things that do not come under the cognizance of the senses — in speculation and abstraction. By the force of thought alone, he would divine, or rather construct, the laws of the universe. Who, too, at some time or other, has not been the victim of some epigrammatic friend? Who knows how much it costs a Boileau, or a Piron, to restrain the expression of his caustic humor? Prevent a Bacon, or a Leibnitz, from reflecting on the connexion of cause and effect, of drawing conclusions, and establishing principles, and you oppose their inclination — you do violence to their passion.

The gradation that takes place in the intellectual talents and faculties, is still more sensible in reference to those fundamental powers, that are only sentiments and appetites. While the cerebral organ of love remains undeveloped, there is no difference between the sexes, to the child. But, according as this organ is developed, the boy and girl begin to fix their attention on whatever relates to the sexual functions, whether in themselves or others; and, in the same proportion, there arises a sentiment, a propensity, which at last is raised to a passion. The same is true of the love of offspring, of self-defence, of the carnivorous instinct, of the sentiment of property, of pride, vanity, circumspection, &c. There are women passionately fond of children; there are persons, passionately benevolent, devout, or ambitious.

Let us now descend to beings, that want one or another of the fundamental powers, and we shall see, that it is impossible they should have a desire, a propensity, or passion for things, with the fundamental power of which, they are not endowed. But give to brutes the fundamental powers, and you have the dog passionately engaging in the chase; the weasel strangling the hens; the nightingale singing by the side of his female with such warmth of passion, as sometimes to sink under his long continued efforts; and the monkey affectionately loving his female and young; but in none of these creatures, can you give rise to the desire, propensity, or passion for devotion, mathematics, or metaphysical speculations. It is clear, therefore, that the desires, propensities, and passions, are not proper fundamental powers, but the result of the different degrees of the activity of the organs, or primitive qualities and faculties.

I have shown then, even in respect to the fundamental faculties, such as the sense of tones, of numbers, &c., which belong to the intellectual faculties, there is a desire, propensity, or passion, according to the degree of their activity. Not only so, but it must be



admitted that perception, memory, imagination, are also the attributes of the fundamental powers, that constitute the sentiment. The instincts of propagation, of love of offspring, of pride, and of vanity, possess indisputably their own perception, memory, imagination, and judgment. In this respect, the sensations and sentiments are affected, like the thoughts produced by the intellectual faculties. The history of insanity and idiotism proves to us, that when one of the fundamental qualities has been lost or enfeebled, its perception, memory, judgment, imagination, attention, all its attributes in short, are equally lost or enfeebled.

I have mentioned cases, where, in consequence of some accidental lesion of the cerebellum, the sexual parts were completely atrophied, and the generative faculty entirely lost. Now, in these cases, the memory of past enjoyment is as feeble as the desire. These individuals talk on the subject with indifference, and it is more from what they have said, than from any impressions they retain, that they know they were once like other men, and, it is to be presumed, that if the cerebellum had entirely lost his action, the memory of the sensations formerly experienced, would be completely gone. I have also related cases, where the total loss of an external sense, and of its internal nervous apparatus, has not only prevented new impressions from taking place, but has effaced the old ones relative to this sense; and why should not the same thing happen, where there is a total loss of the activity of an organ of a moral quality, or intellectual faculty? However this may be, it remains certain, that desire, propensity, and passion are only degrees of the action of fundamental powers, and that it is wrong to consider these degrees, as so many real powers. Consequently, I have substantiated my charge against the philosophy of my predecessors. May the refutation of these errors, consecrated by time, show how useless is all reasoning, unsupported by facts.

*Of Instinct and Understanding, Intellect, or Intelligence. Have they particular Organs?*

The brute acts from instinct, man from understanding, — such is the language of philosophers. In the former, say they, instinct supplies the place of intelligence, which is peculiar to man. But do they act solely from instinct? are they destitute of intelligence? Is man exempt from all instinctive impulses, and beyond the influence of instinct?

We have only to obtain a precise idea of instinct, and of understanding or intellect, and the truth will spontaneously present itself to our minds. Instinct is a sentiment, an inward movement, independent of reflection and volition, — an impulse that impels a living being to certain actions, without its having a distinct idea of the means or end. I now ask, if instinct is a universal power, that explains all the actions of brutes, or whether it varies as much as the fundamental qualities and faculties, and produces only the manifestation of these qualities and faculties? If instinct be a universal power that explains all the actions of brutes, how is it connected with organization? Has it a proper organ? If instinct were a universal power, every animal would do precisely like the rest, and no one would be unprovided with it; the species that makes a web, or constructs hexagonal cells for the reception of its honey, would also sing, or manifest attachment to its master. The spider by means of its web, preys upon flies; the working-bee constructs cells, but kills no flies for food; it tends the young, but has no connexion with the males. Many male animals perform their sexual duties, but take no care of the offspring. The male and female cuckoo, both, abandon the care of rearing their young to other birds, though impelled to intercourse by a very ardent instinct. The beaver constructs its cabin, but neither sings nor hunts; the dog hunts, but does

not build ; the speckled magpie sings, builds, and hunts ; the quail prefers concubinage to marriage, but tends its young, and migrates ; the partridge marries, and takes care of its young, but does not migrate ; the wolf, fox, roe-buck, and rabbit, live in the marriage state, and both male and female concur in tending the young ; the dog, stag, and hare, use the first female that comes along, and know nothing of their young. The ferocious wolf, and the cunning, timid hare, make no burrows, like the courageous rabbit and crafty fox. The rabbits live in a kind of republic, and place sentinels, but not so do the fox and hare. How can these instincts exist in one species of animals, and not in another ? How can they be so differently combined ?

If instinct were a single, general power, not only ought the instincts to be manifested all at once, but also in the same degree. The truth is, however, that while certain instincts act with great force in the young animal, they are completely inactive in others ; certain instincts act at one season, others, at another season. There is one season for propagation, and another, for emigration ; one, for living alone, and another, for assembling in flocks, or collecting provisions. And how are we, on the supposition of a general instinct, to explain why the different instincts, not only exist separately, in different species, but are, many of them, even contradictory ? It is wrong to consider instinct a general power, and explain by it, all the actions of animals, however opposite they may be ; and consequently, it is absolutely impossible to find a single, general organ of instinct, and accordingly the efforts made to find it, have been fruitless. Such expressions serve only to convey the appearance of knowledge, to get rid of all difficulties by means of an *occult faculty*, and to dispense with all laborious research.

Are there as many instincts as there are fundamental powers, and does the term *instinct* merely desig-

nate the activity of these same fundamental powers? Propagation, love of offspring, friendship, and attachment, marriage or celibacy, the social or solitary state, self-defence or love of fighting, preference of animal or vegetable food, providence for the future, circumspection and the precaution of placing sentinels, the choice of a fixed place of abode, emigration, singing, construction, &c., are derived from as many fundamental qualities, or primitive dispositions, and all become instincts from the moment, when, in consequence of their activity, they produce in the animal a desire, a want, an internal impulse, under the influence of which, it is impelled to act. The term *instinct*, therefore, applies to all the fundamental powers, and the instinct must have as many organs as there are fundamental powers. This explains very naturally, how an animal may be endowed with one instinct, and be destitute of another. In this sense, it may be said, that all animals act from instinct, though their acts are very different, and even opposite.

Let us now examine whether, in the manifestation of their fundamental powers, animals always obey a blind impulse? whether they act exclusively from impulse, or, are conscious of their propensities and faculties? whether they modify their instinct by a clear idea of the means or end to be used? in other words, must they be considered to possess *intelligence, understanding*? If animals acted only from a blind instinct, their manner of acting would be always uniform. Experience and external influences would never be able to make them deviate, one hair's breadth, from their ordinary routine; their actions and the order of their occurrence, might be submitted to calculation, like the course of a machine, (which, in fact, is the common doctrine;) but experience teaches a very different lesson. At the very moment the wolf scents the flock enclosed in the fold, the thought of the shepherd and the dog comes to his recollection, and counterbalances the present impression which he



receives from the sheep. He measures the height of the fold, compares it with his strength, judges of the difficulty of leaping over it with his prey, and concludes the attempt would be useless, or dangerous.

Yet, from the midst of the flock, when scattered over the field, he will seize a sheep, before the eyes of the shepherd, particularly if the nearness of the woods affords a chance of concealment. He undermines the park or sheep-fold, when he can find no other means of penetrating it. He needs but little experience, to learn that man is his enemy, and that he must fear his snares. Thus, he is always on his guard. The older he is, and the more dangers he has encountered, the more distrustful he becomes. Wolves will hunt in packs, and the mutual aid they afford, renders the chase easier and surer. If a flock is to be attacked, a female goes and shows herself to the dog, which she leads away in pursuit of her, while the male leaps over the fold and carries off a sheep which the dog is unable to protect. In pursuing a deer, the duty is divided according to the strength. The male watches and attacks the animal, chases and puts it out of breath, when the female, which is placed somewhere ahead, renews the chase with fresh strength, and in a little time renders the contest very unequal. It is easy to entrap a young inexperienced fox, but if he has learned the ways of man, the same means will be useless. No bait can then induce reynard to brave the danger, which he discovers or suspects. He scents the iron in the trap, and this sensation, already terrible to him, predominates over every other impression. If he perceives that snares are multiplying around him, he quits the country for a safer one. Sometimes even, emboldened by gradual and repeated approaches, and guided by his smell, he will find means, safely to himself, of stealing the bait from the trap. Man, with all his intelligence, needs a great deal of experience, not to be baffled by the rudence and cunning of the fox.

When the stag has been often disturbed in his retreat, he conceals himself by an artifice, which can only be the fruit of nice view and deep reflection. He frequently will change his thicket so as to accommodate his location to the wind, in order that he may be aware of whatever may menace him from without. Frequently, instead of confidently returning and going straight to his lair, he will do so only in appearance; and enters the wood, comes out, goes away, and returns upon his track, repeatedly. Without any cause of present disturbance, he uses the same artifices, that he would use to escape from the pursuit of dogs, if he perceived himself chased. I have elsewhere mentioned the means, made use of by stags and hares, to elude the pursuit of the hunters and dogs. Every hunter also knows, how easy it is to surprise these creatures, in countries where they are not ordinarily disturbed; but the moment they have learned from experience, the dangers that threaten them, the hunter finds it necessary to multiply and vary his means.

We have daily opportunities of seeing the difference between a trained and an untrained horse, and the changes, which education effects in the manners of dogs. Whoever has, in the slightest degree, observed animals, must concede to them a certain degree of perfectibility, of which I have mentioned a great number of examples in this work. It cannot be denied, that they remember past facts, and that their conduct is regulated in reference to them; that they compare, reflect, and judge; and that in emergencies they take measures well adapted to the circumstances. All this cannot be the impulse of a blind instinct,—it must be admitted, that, to a certain extent, they are endowed with understanding. But as this understanding is only the faculty of modifying the manifestation of their natural instincts, according to accidental circumstances, it follows, that there is a portion of understanding peculiar to each species, and in virtue of this law,

each species remains confined to the circle in which nature originally enclosed it. Still, it is established that animals exercise their faculties with more or less intelligence, or understanding. Now let us inquire whether man also, acts from instinctive impulses, or exclusively obeys the dictates of reason? Is he the author of his propensities, or are they as involuntary in him, as in the brute?

I do not speak of those automatic movements, that some authors confound with instinct, and which both man and brute do unconsciously, and without any possible premeditation. For instance, we recoil suddenly from the sight of a danger, and in falling, we stretch out our arms, either to come on our hands, or to preserve our equilibrium. I here speak of instinctive propensities,—true instincts. I have proved in the section on innate dispositions, and when treating of the fundamental qualities and faculties, that man neither invents nor creates his propensities and faculties. I know not to what degree of ignorance, are to be attributed the dogmas of that arrogant philosophy which pretends that man is beyond the reach of those laws, which govern the animal kingdom. When man burns with physical love and seeks a companion; when he loves his children and takes care of them; when he defends himself and family against his enemies; when he is proud, vain, benevolent, cruel, avaricious, cunning, and circumspect, who does not know that this takes place without his participation, or resolutions? Who does not perceive, that all these sentiments are movements, dispositions independent of reflection?

They are not the result of attention, of deliberate thought, of premeditation, of volitions. They are genuine instincts. The intellectual faculties also are, in most cases, exercised instinctively. Whenever the organs of these faculties have acquired considerable development, or have been excited by some kind of stimulus, they act involuntarily, without reflection, or

judgment. The child cuts out figures and builds, makes music, or poetry, seeks, in cats and mice, for the causes of the vital phenomena, &c., and all this too, from a blind internal impulse. So far are such individuals from being conscious of their faculties, that when their attention is called to them subsequently, they are astonished to find such extraordinary qualities or faculties. This instinctive action continues, in most men, more or less exclusively, for their whole life; but few persons ever obtain a clear knowledge of their propensities and faculties. The more violent the action of the organ is, the more imperious is the passion; the more brilliant the genius, the more instinctive the activity of the organ, at least in the early periods of its manifestation. My admiration was deeply excited by the following lines of Voltaire, who has achieved so much himself, by the force of instinct, addressed to Diderot, under date of 20th April, 1773.

“All the philosophers together could not have written the *Armide* of Quinault, nor *les Animaux malades de la peste* of la Fontaine, who was unconscious of what he had done. It must be granted that, in the performances of genius, all is the work of instinct. Corneille conceived and wrote the scene between Horace and Cornelius as a bird builds its nest, with this exception, that a bird always does its work well, which is not the case with us.”

It is only, when man turns his attention to his innate internal powers, compares them with the powers of others, learns their use and how to employ them under change of circumstances, and reflects upon himself, that his instincts gradually acquire the character of intellect or understanding. To be endowed with intellect, or possess intelligence, is, in other words, to have a clear knowledge of one's propensities and faculties,—to feel and exercise them with attention. There are, therefore, as many different kinds of intellect, as there are distinct qualities and faculties.



One individual may have considerable intellect, relative to one fundamental power, but a very narrow one in reference to every other. Man, by reason of more and nobler organs, is much more capable than the brute, of acquiring a clear knowledge of his propensities and faculties; and, in consequence of this prerogative, he is endowed with intellect, not exclusively, but in a higher degree than any other animal. To concede to the brutes, what God has given them, is surely not to degrade our own species.

From what has been said, we draw the conclusion, that an organ of intellect or understanding, is as entirely inadmissible, as an organ of instinct.

*Of Reason, Will, and Free-Will. Have they particular Organs?*

Reason is to the intellect or understanding, what the will is to the propensities. Let me explain. In the section on innate dispositions, I have explained the difference between propensities, will, and liberty.\* Desire, propensity, and passion are different degrees of the activity of each fundamental power. Oftentimes man is incapable of controlling the violent action of some one of his organs; in which case, the desire, propensity, and passion that results, are involuntary; and thus arise temptations, which are the first conditions of vice and virtue, because, while we only *desire*, we deserve neither punishment, nor reward. Most often, the brutes have only desires without will, and the same is the case with man, in a state of idiocy or insanity, or when the organs are unusually active. It is only when the will is exercised, that our actions become morally free, and subject to merit or blame.

It is not the impulse that results from the activity of a single organ, or, as authors term it, the feeling of

---

\* Vol. II, on Moral Liberty.

a desire, that constitutes the will. That man might not be confined to desiring merely, but might will also, the concurrent action of many of the higher intellectual faculties, is required; motives must be weighed, compared, and judged. The decision resulting from this operation is called the *will*. There are as many kinds of desires, propensities and passions, as there are fundamental powers. There is but one will. The desires, propensities, and passions are the result of the action of isolated fundamental powers. The will is the result of the simultaneous action of the higher intellectual powers, and supposes attention, reflection, comparison, and judgment. The will is often in direct opposition to the desires, propensities and passions. *Cæteris paribus*, the desires and passions will prevail in a rough, uncultivated man; the will will triumph in the refined and educated man. The brute, the violently excited man, the idiot, and the maniac, have ardent desires and passions, but hardly any will. The actions of those who are solely guided by the desires and passions, are easy to foresee, and calculate, however little we may know of their organization. The decisions of the will, however, cannot be foreseen with much certainty, but by means of a profound examination of the nature of all the motives, which are furnished in part by the organization, and in part by the external world; by circumstances of convenience, morality, religion, legislation, social order, and the good of society. These remarks are sufficient to establish the difference between the desires, propensities, passions, and the will, or liberty; and to convince the reader, that there can exist no particular organ of the will, or free-will.

As little ground is there for the existence of a particular organ of the will, or of free-will. Every fundamental faculty accompanied by a clear notion of its existence, and by reflection, is intellect, or intelligence. Each individual intelligence, therefore, has its proper organ; but reason supposes the concerted

action of the higher faculties. It is the judgment pronounced by the higher intellectual faculties. A single one of these, however, could not constitute reason, which is the complement, the result of the simultaneous action of all the intellectual faculties. It is *reason* that distinguishes man from the brute; intellect, they have often in common, to a certain degree. There are many intelligent men, but few reasoning ones. Nature produces an intelligent man; a happy organization cultivated by experience and reflection, forms the reasoning man. As will and reason suppose the existence of fundamental powers, and as the latter are founded in organization, it is obvious, as I have already proved by other arguments, in the section on innate dispositions, that will and reason themselves are not indefinite powers, independent of organization, and consequently, that there cannot be such a thing as unlimited, and absolute liberty. It is clear too, that, by reason of his nobler organization, man is susceptible of moral motives, which he can weigh, compare, and judge; that the comparison made, and the judgment given, he is permitted to determine in consequence, or, in other words, that he is endowed with moral liberty; that consequently, his actions are meritorious or blameable — moral or immoral.

*Can we find Organs for the Affections?*

Most authors confound the affections with the passions. By passion, I mean the highest degree of voluntary or involuntary activity, of which any fundamental power is susceptible. Each passion supposes a particular organ, which produces passion, as its function, only when in its maximum of activity. It is altogether different with the affections. In the passions, the organs are active, exalted in their fundamental function. In the affections, on the contrary,

the organs are passive, they are modified, — struck, in a particular manner, agreeably or disagreeably. Modesty, terror, anguish, sadness, despair, jealousy, anger, joy, ecstasy, &c., are involuntary sensations, passive emotions, either of a single organ, or of the whole brain.

There cannot be a particular organ for joy, or sadness, or despair, or discouragement, or hope, or any affection whatever. To admit one, would be equivalent to admitting a particular nerve for pain, and a particular nerve for agreeable sensations. Every nerve may be the seat of pain and of pleasure. If we admit a single organ for all the affections, it would follow, that every animal susceptible of one affection, would be susceptible of all, and that this organ, once set in action, all the affections, however unlike or opposite they may be, would simultaneously affect both man and brute.

### *Conclusion.*

These views of the qualities and faculties of man are not the fruit of subtile reasonings. They bear not the impress of the age in which they originate, and will not wear out with it. They are the result of numberless observations; and will be immutable and eternal, like the facts that have been observed, and the fundamental powers, which these facts force us to admit. They are not only founded on principles deduced from individual facts, but are confirmed by each individual fact in particular, and will for ever come off triumphant, from every test to which they may be submitted, whether of analysis or synthesis. If the reasonings of metaphysicians are ever discarded, this philosophy of the human qualities and faculties, will be the foundation of all philosophy in time to come.



*Division of the Moral Qualities and Intellectual Faculties.*

The moral qualities and intellectual faculties may be differently divided, if considered in a different point of view. We may divide them into sentiments, propensities, talents, and intellectual faculties. Pride and vanity, for instance, would be sentiments; the instinct of propagation and the love of offspring, propensities; music and mechanics, talents; and comparative sagacity, an intellectual faculty. It is often perplexing, however, to fix the precise limits of each division. The intellectual faculties and talents, when their organs are very active, are manifested in company with desires, propensities and passions; and the sentiments and propensities have also their judgment, taste, imagination, and memory.

The division into qualities and faculties which are common to man and brutes, and qualities and faculties exclusively possessed by man, is very valuable, I acknowledge, in a philosophical point of view. But since there are naturalists who think they perceive in some brutes, certain monkeys for example, an idea of justice and injustice, and even a sentiment of the existence of God, and since the more cautious observer would not venture to decide where the faculties of the brute end, and those of man begin, it must be acknowledged, that this division would not be generally satisfactory.

The best division appears to me to be that of fundamental qualities and faculties, and that of the general attributes of these same qualities and faculties. We thus preserve, and profit by the fruits of my predecessors' labors, while we establish the true theory of the primitive and fundamental instincts, qualities, and faculties of man and brutes. These two divisions have just been discussed. In order to complete my work, I now proceed to present to my

readers some propositions of the highest importance, whose solution directly depends on the physiology of the brain.

*What are the Motives of our Actions?*

So long as the philosopher, the moralist, the judge, and the legislator have not a minute acquaintance with the springs of our actions, their interpretations, their imputations, their decisions, and their laws, will always be wrong. Hitherto nearly all writers have considered self-love or interest, as being the sole motive of our desires, and the will, as the sole agent in determining our actions. It is evident, however, that there must be as many motives to action, as there are primitive qualities and faculties. Here too the comparison of man with the brutes, will be of great utility. The actions of the brutes are simple, free, and exempt from all doubtful interpretation; while those of men, on the contrary, are almost always more or less complicated, and the individual himself is, very often, unable to render a reason for them. Their motives are doubtful, and never entirely free from capricious subterfuges. The most powerful springs of the actions of brutes, are the instincts of propagation, of love of offspring, of attachment, of self-defence, of the sentiment of property, &c. Their actions are very often determined by envy, jealousy, hatred, anger, cruelty, and benevolence. Surely no philosopher can pretend to have indicated the motives of animals, by attributing them to interest, self-love, or, the sole desire of self-preservation. Man being endowed and governed by the same desires, the same propensities, the same passions, and the same affections, his actions must be determined by the same motives. Our social, civil, and religious institutions are due, in a great measure, to the instincts of propagation, of love of offspring, of self-defence, of the sentiment of

property, of vanity, ambition, the desire of independence and domination.

We have only to call to mind my observations on each organ, and its sphere of activity, to have a general view of the natural history of the moral man. I have given the reasons, why one person applies himself to the arts and sciences, while another finds his happiness in sloth and ignorance; why every one, from the Brahmin to the cannibal, from the slave to the despot, from the most superstitious devotee to the most arrogant infidel, believes himself possessed of excellent motives for his belief and conduct. Excite the fundamental qualities and faculties till they act with energy, and you will then see the motives of all the extravagances of passion, of all the wonders of genius, and of all the efforts of virtue and wickedness. Vary the age, sex, temperament, health, or nourishment, and you vary the action of the cerebral organs, and frequently, the desires, propensities, passions, and ultimately, the motives and determinations.

Thus far, the actions of men are scarcely less instinctive, than those of brutes. Knowing the qualities and faculties, and the degree of their activity, we can infer the motives; and the actions themselves, it is as easy to predict. The modest artist, under a thousand humiliations from the rich, will continue to cultivate the arts; the benevolent, after a long experience of ingratitude, will be always impelled to acts of beneficence; and the rash, crippled by wounds, will always rush into battle. Thus in most cases, man has less to do, in originating his actions, than nature. But give to him all his prerogatives, let him act with reason and will, from that moment he becomes a free moral agent. Whoever would wish to foresee or judge his actions, must not only know his natural disposition, but also all the external elements that concur in producing his determinations; for the acts of reason and will are often diametrically opposed to the instigations of the desires, wants, and passions.

It follows, as I have elsewhere remarked, that if you would always have actions to be the result of deliberate reason, you must cultivate the inward qualities and faculties; multiply, ennoble, and enforce the outward motives. It follows, too, that the virtues and crimes of men may as justly be imputed to those, who are charged with their education and government, as to those, who are themselves patterns of virtue or crime.

It is still objected, that all the qualities and faculties together constitute the *moi* of the individual; that every gratification of a desire, propensity, or passion, is connected with his interest and self-love; and consequently, that the motives of his actions are all resolved into interest, or self-love? I reply, that the philosopher's rage for abstracting and generalizing, has also generated this false theory, which considers all the moral qualities and intellectual faculties, as simple shades of the single, solitary principle, sensibility. As sensibility alone will not explain the phenomena of voluntary motion, the different functions of the five senses, the moral qualities and intellectual faculties, so neither are interest and self-love, considered as the sole motives of our actions, sufficient to account for instinctive acts, nor for the deliberate convictions of human reason.

*Of the origin of the Arts and Sciences, and of different Communities.*

The origin of the arts and sciences, and of different communities, is almost universally attributed to chance, necessity, or reflection. Even the earliest and most indispensable of human occupations, are derived from the same source. Hunting and fishing, it is said, were invented, because the spontaneous fruits of the earth were insufficient for the nourishment of families; and when families have become so numerous, as to form tribes and nations, they have been obliged to resort to



agriculture ; the women and children not finding sufficient food, man is obliged to attach himself to one woman only, and to share with her in the domestic cares. Here is the origin of marriage, and of society, which goes on increasing in numbers, and giving rise to all the wants. The inclemency of the weather is to be guarded against, and thence spring the arts of making clothes, and building houses and palaces. Thence also, arise the factitious wants, all the desires and passions, which are the result of inequalities of condition, vanity, love of distinction, and glory, ambition, avarice, war, luxury, with the excesses it cherishes, laws, police, religion, the thirst for strong emotions, music, eloquence, poetry, and shows.

If outward accidental causes are the source of all these inventions, why have they not produced the same effects in the brutes? Why does not the dog build a house to protect him from the inclemencies of the weather? Why do the partridge and raven perish of cold, rather than migrate like the swallow? Why is it that each animal satisfies its wants in a manner peculiar to itself? that each man has different wants, though outward circumstances are very nearly the same in all? In treating of the fundamental powers of man and brute, I have satisfactorily answered these questions. The true source of the arts and sciences, is our innate instincts, propensities, and faculties — our inward wants.

Who invented the spider's web, the beaver's cabin, the hang-bird's nest, the bee's cells, the nightingale's song? Who suggested the idea of a republic to the ants, of tricks to the monkeys, of sentinels to the chamois, of migration to the storks, of hunting to the wolves, of provisions to the hamsters, of marriage to nearly all the birds, and a large part of the mammifera? All these things are universally attributed to instinct, to an inward impulse, never to external circumstances. The cause of these inventions, therefore, lies in the organs, or, in other words, animals

have received from nature, by means of organs, certain definite powers, propensities, talents, and faculties, which produce their habits, that have so often the appearance of spontaneous and deliberate actions. It is precisely the same with man. All that he does, or knows, all that he can do, or can learn, he owes to the author of his organization. God is its source ; the cerebral organs, his intermediate instrument. The same organ, which in the nightingale produces singing ; in the beaver, the faculty to build ; in the hamster, the propensity to lay up provisions ; produces in man, music, architecture, love of property. The poet, the orator, the legislator, the minister of religion, are the work of God. Chance may furnish a faculty, the occasion of displaying activity, but when the faculty does not exist, it accomplishes nothing. Pythagoras, passing by a blacksmith's shop, was struck with the gradations of the different sounds of the hammers. He examined them carefully, and made one of the most brilliant discoveries in acoustics, and one which has most contributed to the perfection of music. To Newton, the fall of an apple from the tree, was the occasion of discovering the laws of gravitation. How often has the sound of hammers been heard, and apples seen falling to the ground, without giving rise to the slightest presentiment, that these phenomena take place by virtue of certain laws of nature ? I showed, while treating of each particular fundamental power, that oftentimes, the first *instinctive* efforts of genius are master-pieces. It is not until after he has constructed machines, and built houses, for ages together ; spoken language, whether of words, or signs ; cultivated painting, sculpture, music, poetry, eloquence, that man thinks of seeking for the rules of these arts, and of fixing their laws. During the same time, too, he has reasoned correctly, without inquiring for the rules of logic ; he has compared, and judged, without suspecting that the flow of his ideas was confined to any necessary catenation.

He was a logician, long before he had learned any logic; and in the same way, he decided what was just, and what unjust, long before having any acquaintance with jurisprudence.

No valid objection to my reasoning can be drawn from those inventions or discoveries, which, like organology, or any branch of natural history, are, in fact, the fruit of accidental circumstances, and of the simultaneous action of several intellectual faculties — of combination, analysis, abstraction. These discoveries have not been made by any particular organ; they are the result of observation, of the faculty of ascertaining what individual phenomena have in common, of learning the laws of phenomena, and applying this knowledge to a specific object. The progressive improvement of inventions and discoveries, is not to be attributed to any particular power, but is the result of application and experience; the first invention is the work of genius. Neither let it be objected that, upon my principles, any man, supposing him to have lived under favorable circumstances, might have invented all the arts and sciences. A man of moderate powers — and of such is the majority of mankind — invents nothing, and creates nothing, of himself. His faculties only are competent to appropriate, what is already invented. It is only remarkably developed organs, whose activity is exercised on things without, that leave their impressions on the external world — that, in a word, create.

Banish music, poetry, painting, sculpture, architecture, all the arts and sciences, and let your Homers, Raphaels, Michael Angelos, Glucks, and Canovas, be forgotten; yet let men of genius of every description spring up, and poetry, music, painting, architecture, sculpture, and all the arts and sciences will again shine out in all their glory. Twice within the records of history, has the human race traversed the great circle of its entire destiny, and twice has the rudeness of barbarism been followed by a higher degree of refine-

ment. It is a great mistake, to suppose one people to have proceeded from another, on account of their conformity of manners, customs, and arts. The swallow of Paris builds its nest like the swallow of Vienna, but does it thence follow, that the former sprang from the latter? With the same causes, we have the same effects; with the same organization, we have the manifestation of the same powers.

Ferguson has very justly remarked, that, "if we may rely on the general observations contained in the last section, the literary, as well as mechanical arts, being a natural produce of the human mind, will rise spontaneously, wherever men are happily placed; and in certain nations, it is not more necessary to look abroad for the origin of literature, than it is for the suggestion of any of the pleasures or exercises, in which mankind, under a state of prosperity and freedom, are sufficiently inclined to indulge themselves.

"Ages are generally supposed to have borrowed from those, which went before them, and nations to have received their portion of learning, or of art, from abroad. The Romans are thought to have learned from the Greeks, and the moderns of Europe, from both. From a few examples of this sort, we learn to consider every science, or art, as derived, and admit of nothing original in the practice, or manners of any people. The Greek was a copy of the Egyptian, and even the Egyptian was an imitator, though we have lost sight of the model on which he was formed.

—"Painting, sculpture, and the other imitative arts, are as ancient as the human race; they are found to exist, whenever men are formed into societies; no individual, therefore, can claim the honor of being their inventor."

Thus God is every where the artist, and man only the instrument.



*Is the Human Species capable of Indefinite Perfectibility?*

This proposition includes two entirely different points of view. It may be asked, whether the species can ever lose or acquire any quality or faculty whatever? and whether the faculties and qualities inherent in our organization, are capable of a constantly and indefinitely progressive course of improvement? The reader must beware of confounding these two questions, both of which organology can answer.

*Can the Human Species ever lose or acquire any Quality or Faculty whatever?*

Man can manifest no other qualities or faculties than those, whose manifestation is provided for by material instruments, the number of which is definite. While the present creation lasts, the number of these material instruments will neither be increased nor diminished; so that the species can never lose nor acquire any faculty, whether good or bad. If some philosophers boast of the indefinite perfectibility of the human race, and, on the other hand, if some moralists deplore its constantly increasing depravity, their reveries must be attributed to the erroneous hypothesis, that the moral man is only the result of chance and outward circumstances; that, in short, he is a being capable of infinite modification, and is subject to no law of nature. The forms of crystals and of plants, have never varied since the creation, and never will vary. Just so invariable is the organization of the human race; consequently, his moral and intellectual character can experience no essential change.

In several parts of this work, I have refuted all the prevalent notions concerning the pretended influence

of the social life on the origin of the factitious qualities and faculties. Man can possess no artificial quality or faculty. He is designed, by his organization, like many species of animals, to live in society, and consequently, he must be provided with all the qualities and faculties, necessary to the maintenance of the social state. Communities are the result, not the cause of their moral qualities and intellectual faculties. Will it be said, that the republics, in which bees, ants, and beavers live, have produced the instincts of these beings? Is it not far more reasonable to believe, that their innate instincts have collected them into republics? If you hesitate to admit this opinion, form the foxes, tigers, and vultures into flocks, and show us a single artificial quality or faculty, which will result from their association. Where is the vice or crime, that sullied the memory of our forefathers, which no longer disgraces our own history? Where is the virtue, that adorned the early ages of the world, which is not also the boast of our own time? Read the ancient moralists and historians; the men of Horace, Homer, Lucan, Livy, and Socrates, are the men of Montaigne, La Bruyere, Voltaire, Bossuet, and La Rochefoucault. To maintain, that any virtue whatever has disappeared from the surface of the earth; that our times present fewer examples of generous forgiveness, of sacrifices to friendship, of heroic courage, of conjugal fidelity, of maternal love, of love of country, than the time of the Trojan war, would be as absurd, as to maintain that the sun has ceased to warm the earth, and the dew to refresh the fields; to maintain that cruel revenge, base perfidy, calumny, envy, perjury, servile adulation, false witness, espionage, ingratitude, thefts, murders, luxury, war, despotism, visit society with their desolations, less than in the time of Joshua and Nero, would be no less an error, than to believe that earthquakes, inundations, storms, and tempests, will no longer devastate our land.

Finally, what qualities would they derive from the civilized state? Is it property? I have proved, that the sentiment of property is innate, not only in the human species, but also in brutes. And in the same place, I have shown that the savages and barbarians of all times, have had their respective properties. Is it pride, ambition, vanity, love of gain? or is it certain talents? But the savage and the barbarian are vain and proud, and their principal concern is for dress and pleasure. They share all our vices, in the very bosom of the forests, and dispute with the inhabitants of cities for the palm of extravagance. Games, even those of hazard, also belong to the remotest times. The savage brings his furs, his tools, and his necklaces to the gaming table, and there he finds the excitement and agitation, which monotonous labor cannot furnish. While his fate is yet undecided, he tears out his hair, and strikes his breast with the fury of the most accomplished player, and often quits the game naked and stripped of every thing he possessed. In countries where slavery is the custom, he stakes his liberty for the single chance of regaining what he has lost. Is not this a faithful picture of the frequenters of our own gambling houses? In talents, savages and barbarians often surpass us. They frequently manifest a penetration, a force of imagination, and even of elocution, a warmth of soul, a courage, a constancy of affection, to which the arts, education, and politeness of the most cultivated nations, have nothing to add. If the object be to penetrate the thoughts and intentions of those, with whom they have to deal, their glance is piercing and sure. If they design to cheat or deceive, they veil their design with so much skill, that it is difficult for the most subtle person to escape their toils. In the public councils, their eloquence is figurative, nervous, and glowing with warmth, and in the negotiation of treaties, they show the most perfect discernment of their national interests. In times of peace their intercourse is friendly,

even in the rudest state, and they are affectionate to one another. An individual enjoys the greatest security, both in respect to his property and person. The principles of honor, generosity, and justice, are practised with an enthusiasm, equal to the violence with which at other moments, they practise revenge and cruelty.

Thus all the pretended factitious qualities and faculties, are an original possession of the human species, and not the subsequent effects of invention and discovery. It is in the dispositions of uncultivated men, of barbarians and savages, that we must study the natural dispositions of civilized nations. Thucydides, notwithstanding the prejudices of his country against every thing that bore the name of barbarian, was conscious, that the manners of ancient Greece were to be studied in the customs of these people. The inverse of the proposition is equally true. Study the propensities and faculties of civilized man, and you will know the propensities and faculties of savages and barbarians. The germs of all that man has ever done or ever will do, even of his political institutions, are enclosed in his organization, for time and circumstance to develope and ripen. All this is merely modification; the essence is and will be, always and every where, the same,

### *How far is the Human Species Perfectible?*

The question then, is no longer, whether the human species may lose or acquire any quality or faculty whatever; but whether the qualities and faculties, inherent in this organization, are susceptible of a continually progressive improvement, or, whether nature has placed limits to their perfectibility.

The hope of a constantly increasing improvement of our species, is a pleasing and animating sentiment. But, alas! the laws of organization and the records of



history, destroy the illusions of the metaphysicians. The elephant and the whale, though infinitely larger than the mite: the cedar and the oak, infinitely taller as they are, than the moss, have still their prescribed dimensions. And will you pretend, in your presumptuous arrogance, that the organs of your brain will meet with no limits in their development and activity! It is idle, to object to me the distance between brutal ignorance and refined learning, — between the savage and the civilized man. We have seen that this distance is marked by no essential difference. Cast a careful look at the various conditions of the human family, even in the civilized, and you will see depicted with equal fidelity, both its littleness and its grandeur.

Surrounded as we are by refined and cultivated men, we readily attribute to mankind in general that progress and perfection, for which we are indebted to a few individuals. As long as we have had any knowledge of our race, the generality of men have been the slaves of ignorance, error, prejudice, and superstition. Slavery, brutality, and sensual gratifications of the grossest description have ever been the main features of his history. Even the hunters, fishermen, and tillers of the earth, have hardly possessed the knowledge necessary to their employments. Every thing is done mechanically; to deviate from the old routine, to alter, and improve, is to them, absurd, ridiculous, and criminal. Mechanics too are scarcely any better. The majority resemble automata, more than intelligent beings. Laborers, and, in short, all who are obliged to spend the most of their time in obtaining the necessaries of life, either do not think at all, or have but a few ideas relative to the satisfaction of their wants. Though encompassed by the wonders of nature, they are hardly touched by the melodies of birds, or the beautiful tints of flowers; the changing seasons, the meteors with all their diversified and striking appearances, even the majestic spectacle of the

stars, never excite their curiosity, and scarcely ever arouse their minds from indifference and supineness.

Let us pass to the higher classes. The influence of the heads of government on the prosperity or decline of the arts and sciences, we know, is incalculable. They are aware, that, in encouraging talents, they are embalming their own names; that though conquests astonish the world, the protection of industry draws upon themselves the blessings of ages. The immense range of their duties, and the tyranny of etiquette, scarcely allow them to devote a few moments to lighter and more pleasing cares. Too often, the jealousy and ignorance of favorites inspire them with mistrust of the men, who attack with superior power the abuses and weaknesses of their time; and the most generous and beneficent efforts of genius, instead of being welcomed, if not completely crushed, are at least hampered and checked.

They who vegetate in lazy opulence, are content with suing for office and distinction, with decorating themselves with medals and ribbons, and dissipating their whole life in sensual pleasures. Their fortune and influence dispense with the necessity of reflection and form the propensity to idleness, so natural to the majority of mankind. Hence it is that pomp and ignorance are as inseparable, as dissipation and misery; hence the sad truth, that the class, which from their imaginary elevation, looks down on the people with disdain, is moreover, in point of intelligence, on the same level with them. There is the same indifference, the same prejudice, and the same aversion towards new truths; the same tenacious adherence to old errors, the same credulity and the same superstition. The fatidical flight of birds, the fatidical oaks of the forest of Dodona, the sorceress of Thessaly, the magic of Egypt, the oracles of Delphos are replaced by fortune-tellers, prophets, interpreters of dreams, presentiments and inspiration, hobgoblins, ghosts, and unlucky days and numbers. We still live with Romans

and Spartans, who seek to know the future, in the motions of the bills of birds, and in the entrails of beasts ; we have yet our Mithridates and Alexander, who employ conjurers to interpret their dreams. Penetration and prudence and great military and political talents, and the height of civilization, are as incompetent now, as they ever were, to guard ignorance from the most puerile, absurd, and superstitious practices. Can those even, who are led by the energy of their faculties to reflection and the search for truth, fortify their minds against error ? Can they save themselves from the wildest extravagances ? The fatalism of Zeno, and the absolute, indefinite liberty of Ancillon ; the Iroquois notion of the immortality of brutes, and that of Descartes of their automatic nature ; the doctrine of Parmenides, that God includes all ideas, and that of Malebranche who saw all things in God ; the belief of Empedocles in the transmigration of souls ; the numbers of Pythagoras, which the Supreme Intelligence used for direction in the creation of the world ; the blank table of Helvetius ; the doctrine of Lucretius, which attributes the creation of the universe to the concourse of atoms ; Berkeley's disbelief in the existence of matter ; the molecules of Buffon ; the monads of Leibnitz ; the atoms and the voids of Leucippus and Democritus ; the approval of suicide and contempt of all property, of Antisthenes and Diogenes ; the voluntary sufferings and abstinence of Epictetus ; the merry philosophy of Aristippus and Epicurus, &c. &c., are but specimens of the efforts of philosophers, most of whom were the admiration of their age.

We need not speak of the interminable, and often bloody, controversies of theology, the eternal vacillation of the forms of government, of the present infancy of criminal legislation, of the fluctuation of the principles of civil law ; the disputes relative to national law, supported, as they always are, by force and violence ; let us look where we might have some grounds to expect indefinite perfection. Compare with modern

works of art, the temple of Dendera in Egypt, the Pantheon at Rome, the temple of Nîmes in France, the vast temple at Heliopolis in Syria, now Balbec, the immense circus at Rome, the arenas in the city of Nîmes, the theatre of Marcellus at Rome, Trajan's column, the Antonine column, a vast temple at Pæstum, the temples of Pole in Istria, the ruins of Thebes, of Sienna, of Persepolis, and, most astonishing of all, those of Palmyra, the Baths of Titus and Caracalla, and the excavations of Herculaneum and Pompeii. Compare the poets, painters, and orators of our days, with Homer, Virgil, Horace, Ovid, Tasso, Cicero, Michael Angelo, and Raphael, and then maintain, if we can, that the productions of the mind are always progressing in improvement.

All that man can immediately attain by the force of his powers; all that is the result of great genius, he has and will attain, whenever favored by nature with a large development of his organs. But, where the progress of the arts and sciences, requires a particular concurrence of fortunate circumstances and combinations, it is impossible to fix a limit to our knowledge. The positive arts and sciences, geometry, astronomy, experimental physics, navigation, chemistry, anatomy, surgery, medicine, agriculture, natural history, bear no resemblance to their former condition. Still, since our capacities are always limited, we necessarily lose as many old ideas as we obtain new ones, and when the mass of society shall be enriched by innumerable discoveries, individuals will no longer be astonished. Every one is obliged to confine himself to a particular sphere, to make ever so little of his privileges, and scarcely has he begun to flutter on the height of his domain, when he is precipitated into the abyss of nothing. We see nations remaining for thousands of years stationary in mediocrity, and none have gradually risen for any length of time, towards moral and intellectual perfection. Athens and Rome have sunk into barbarism, and the flux and reflux of the ocean every where represent the history of human affairs.



Philosophers have always drawn an argument in favor of the indefinite perfectibility of our species, from the uniformity of the actions of brutes. But the sum of men's dispositions, and consequently their principal actions, are every where alike. People the most remote in time and place, are united together in their interests and institutions. We deceive ourselves when we consider the maxims of the present day, as the results of modern reflection and experience. The morality of Pythagoras, of Socrates, and of Christ, are all equally founded on the sentiment of benevolence, and the good of society. Even savage nations, have presented perfect models of our civil and political institutions. At the time of the first settlement of Europeans in America, the six nations of North America were leagued together, and had their States-general. The stability of their union, and the wisdom of their conduct gave them an ascendancy over the whole population between the mouths of the St. Lawrence and the Mississippi. They showed themselves as well acquainted with the interests of the confederation, as with those of separate nations, and studied to maintain the balance between them. The representative of each nation watched the designs and movements of the rest, and neglected no opportunity of increasing the influence of his tribe. They made alliances, and treaties, like European nations, which they respected or violated from reasons of state. A sense of necessity, or considerations of utility, kept them in peace; while jealousy, or any other cause of rupture, made them resume their arms.

Thus, without any fixed form of government, and in a way, with which instinct had more to do than reason, they were guided by the same maxims, as modern government. The conclusion is — and it is supported by all the observers of our race — that the history of all nations, from their savage state to their highest pitch of civilization, is perfectly alike.

Finally, when I see the greater number of people

despising the arts and sciences, and with all the arrogance of ostentation and power, consuming all their powers in commercial pursuits, or sensual enjoyments; when I see the proneness of men to sloth, and the commonest ideas, and their invincible aversion to every mental effort, and innovation; when in travelling among people styling themselves the most cultivated in the world, I find at every step, entire provinces still plunged in barbarism, and see that the same men not only bear with indifference the vilest condition, but shrink from whatever would point them to a lot worthy of humanity; when history teaches us that sometimes, nations which have risen to the summit of distinction, relax their efforts, and that after a few ages of light and knowledge, either in consequence of their own sloth, or the jealousy of their neighbours, they again find themselves in the depths of ignorance and barbarism, — who, after such reflections, can help maintaining, that the moral perfectibility of the human species is confined within the limits of his organization.

*What is the World of Man, and of the different Species of Animals.*

The natural history of instincts, of industrious habits, propensities, and faculties, and the demonstration of their organs, necessarily leads to the conclusion, that the moral and intellectual world of man and the brutes, begins where the brain begins, and ends, where the brain ends. The following considerations raise this assertion to the rank of an incontestable truth.

Inanimate bodies are unconscious of their existence. They have no *moi*; nothing tells them that they are individuals independent of other beings, and alone, though infinitely multiplied, they would constitute a perfectly dead nature. Life, *moi*, consciousness of

the existence of the world, begins with sensation, with the nervous apparatus. When the individual perceives, that it is distinct from surrounding things, it has a *moi* whose capacity will be in proportion to the variety and intensity of its sensations; and consequently, to the number and energy of the organs of internal sensibility, and external relations. The more numerous the organs in contact with external objects, the more extensive will be the world of the animal. To the general, vague, indefinite sensation, add sensations that are determinate and essentially distinct from one another, and you gradually modify and enlarge its world. Each sense, each organ, becomes a new revelation. Taste, smell, hearing, vision, touch, each make known to him existences, and different relations of the world, and whether wholly or partially combined, the aspect of this world must essentially vary. Applying these remarks to the organs of the moral qualities and intellectual faculties, we may consider them to be also so many points of contact with the external world; so many sources of new kinds of sensations, sentiments, instincts, propensities, and faculties; but we have seen, that they are unequally shared by the different species of brutes. Their internal and external world must therefore vary to infinity; diminishing or increasing in the same proportion, as the number of these organs diminishes or increases.

What a difference between two beings, one of which, scarcely higher than the plants, and nearly unconscious of its existence, is generated from their decay; and the other which is led to the propagation of its species, by the warmest desires, and the most exquisite enjoyment! Give to these beings the love of offspring, and this organ becomes an inexhaustible source of the tenderest feelings, the dearest cares, and the most anxious solicitude. From this moment, the whole existence of the man and woman, of the male and female, seems to be in reference to these two

powerful instincts. Destroy these two organs, and, though all the rest remain, the interest and charm of life are destroyed. The delights of the marriage state, and the sweets of friendship and social intercourse, we owe to a cerebral part. By means of a cerebral organ too, the Creator has inspired us with the right and the duty of defending ourselves, our children, friends, property, and country, against the assaults of enemies. Without this and the organ of the carnivorous instinct, the economy of man and animals, would be totally changed. Now, what an effort is here to seize the prey; there, to escape from the murderous tooth! War especially gives a form and object to communities. The necessity of public defence assembles together the most different men, and opens an immense range to the moral and intellectual powers. What scenes in the life of individuals, as well as in the history of nations, have these organs produced, and are, every moment, producing!

Cunning, craft, finesse, tact, prudence, sometimes the safe-guard of the weak, at others, the instrument of the strong, owe their manœuvres and intrigues to the same organ, as that to which the fox owes the fortunate issue of his nocturnal expeditions.

Remove another cerebral part, and you deliver men from the propensity to theft, but at the same time, destroy a great part of our social institutions. By rendering us indifferent to property, you take away one of the most powerful motives for our actions; the arts and talents would soon be sacrificed to idleness and indifference.

Were there no organ to assign to each animal a suitable place of abode, what confusion would result! This organ preserves the balance in the distribution of the animal kingdom, and peoples the plains and the mountains, the fields and the forests, the air and the water.

If man is deeply impressed with a sense of his own value; if he rises above his fellows; if he breaks



the chains of slavery; if he arrogates supreme authority, and thus gives rise to governments, think not this to be the work of man. It is the author of all things, who, by means of a particular organ, has subjected the human species to this arrangement.

The pleasure you find in pretended distinctions, the delicious reveries of those, who are seeking for honors,—this spring of such indefatigable activity, also comes from a cerebral part. What an amount of enjoyment and care, what an abundant source of follies and noble deeds, would be taken away, the moment the functions of this organ should cease!

Without circumspection, neither man nor brutes would be guarded against the dangers of inconsiderate and precipitate conduct; they would never carry their thoughts to the future, nor would they perceive the obstacles or perils of an enterprise.

What power renders man and brutes attentive to the events, that are passing around them, and teaches them to turn their propensities and faculties to account, under the circumstances in which they are placed? Take away the organ of educability, and brutes would cease to be useful to man; agriculture and civilization would be impossible; all our faculties and propensities would be confined to a narrow, determinate sphere of action, and man, like the brute, would be the slave of his propensities.

The organ of the sense of locality, every year, preserves, by means of migration, half of the animal kingdom from inevitable death. Man, under the impulse of this organ, traverses lands, and seas, and worlds. Without this organ, how much less knowledge, resources, and objects of admiration, should we possess!

Take away for a moment, the organs of painting, music, architecture, design, and sculpture, and we should no longer have the chefs-d'œuvre of Raphael, of Mozart, of Michael Angelo, of Canova, and of Homer.

The superficial observer never suspects, that he also

owes the faculty of communicating his thoughts, and transmitting them by articulate language, to a particular cerebral organ.

You congratulate yourself on being the friend of justice; your moral sense inspires you with high conceptions of your own nature; and your benevolence charms you. Yet, without a particular organ, all your glory, and all those fine emotions would be absolutely impossible.

Would you know why the brute never rises above earthly things; why he never sees the relation of cause and effect; why he does not know and adore the supreme intelligence? Learn how God has formed man. Follow step by step the eternal laws of the gradation of nature. There is no power without its organ, and new organs, give new powers. Now place man before you, and contemplate his high and prominent forehead; compare that majestic forehead with the depressed forehead of other creatures, and you will learn why man *is* man. Against this forehead are placed those organs, that bestow on him the human character, and by means of which, he penetrates the relations of causes and effects, and is made capable of will and reason. Place your hand on the front and top of his head, and you will there find the sign of the alliance, which his Creator has concluded with him. There is the organ, which has been commissioned to reveal to all nations the Supreme Intelligence,—the organ, which, enthroned in the noblest organization on earth, has always exercised, and will always exercise, supremacy over all human interests.

The world of each species of animals, is therefore the sum total of their cerebral organs—the sum of the relations, or points of contact between external things and internal organs. Where there is no organ, there is no relation, nor revelation. The turtle can never rise to the instincts of the elephant, nor the elephant conceive of the intelligence of man; and man having received no organ for conceiving of the infinity

of worlds, of the eternal duration, or beginning of things, or understanding the essence of God, is condemned to absolute ignorance of these mysteries. Let those who presume to compare themselves, so to speak, with the Divinity, to understand and explain the laws that govern the universe; and those, who, with vain-glorious boasting, believe they may dispense with the necessity of a supreme and independent Intelligence, remember, that all the material conditions of their thoughts and conceptions, are compressed within the compass of twenty-two inches. On the other hand, let us call to mind the industrious habits, instincts, propensities, sentiments, and faculties, which from the insect to man, characterize and diversify the immense multitude of animal beings, and, overwhelmed with feelings of adoration, prostrate ourselves before the Creator, who has transformed such slight materials into the instruments of such sublime and numerous powers! Are we to cast a stone at the physiologist, who, in the height of his astonishment, exclaims; *God and the brain! nothing but God and the brain!*

*Moral Precepts resulting from the Physiology of the Brain.*

The world, so far as knowledge is acquired by the external senses, must necessarily be modified in as many ways, as the senses themselves are modified. The wolf scents differently from the sheep; the eyes of the owl are affected by the light differently from those of the eagle. When the wolf, sheep, owl, and eagle, decide on the nature of effluvia and light, their judgments, though different, will be equally true, since they are all in accordance with the sensations produced on each, by light and effluvia. But the senses and their functions, are not only differently modified in different species, but also in the different individu-

als of the same species. The dish that is a dainty to you, may be loathed by me. Your hotch-potch may be an abomination to me. Still, no one thinks himself authorized to blame others for this difference in their tastes. There are many more reasons, why we should pardon the difference, and often opposition, of our propensities, sentiments, and faculties. What an immense variety in the development, excitability, and relative proportions, of our cerebral organs! Each individual, in himself considered, that is, independently of external influences, is marked by his own peculiar moral and intellectual character, and, placed in contact with the external world, receives his own impressions, and sensations. Consequently, the propensities, sentiments, and judgments of each individual, and the actions, that result from them, must differ from the propensities, sentiments, judgments, and actions of other individuals. This is why every body has reason to consider the criticism of others unjust, and it is doing violence to a natural law, to require the propensities, faculties, judgments, and actions of others, to accord with our views of things. Each has his personal rights, and unlimited toleration for every thing, that does not disturb the order of society, is the first, most sacred, and most philosophical duty. Here again is a proof, that he who discovers and publishes new physical truths, ought not to be afraid of contradicting moral truths.

### *Conclusion, and Summary Review.*

Here, then, terminates this work, which, for fifteen years, the learned have been impatiently expecting. I should have wished to defer it still longer, to bring the fruits of my researches to greater maturity; but the final hour draws near, and I must be content with leaving this first effort in the physiology of the brain, far less perfect than it will be fifty years hence. I have



several times mentioned, how many means I have as yet failed to obtain, for positively demonstrating the results of my labors. It needs infinitely more materials to convince others, who, for the most part, are but little accustomed to observation, than, to convince one's self.

In order to put my successors on the proper track for improving my system, I have made a long list of questions, that remain to be answered, and I intend to devote a particular chapter to points, of which we are yet ignorant, but which it is indispensable for us to know. But, I am afraid of daunting young naturalists, who would shrink from too formidable an array of difficulties, when, otherwise, they would begin with courage, and remove one obstacle after another.

I regret, and always have regretted, that I dare not flatter myself, that my undertaking will ever be continued in all its details, or, that my exertions will be appreciated. Whoever is not impelled by an innate instinct of observation ; whoever finds it hard to sacrifice his opinions, and the views he has derived from his earlier studies ; whoever thinks more of making his fortune, than of exploring the treasures of nature ; whoever is not fortified by inexhaustible patience, against the interpretations of envy, jealousy, hypocrisy, ignorance, apathy, and indifference ; whoever thinks too highly of the force and correctness of his reasoning, to submit it to the test of experience, a thousand times repeated, will never do much towards perfecting the physiology of the brain. Yet, these are the only means, by which my discoveries can be verified, corrected, or refuted. The reader will pardon me, if, independently of the proofs of organology, which I have furnished, in treating of the fundamental powers, I also rely on experiments made in the presence of a great many persons, who accompanied us in our visits to prisons, &c.; for, I would neglect nothing, that might encourage the learned to study the functions of the different cerebral parts. The following is a translation

of an authentic account of my visits to the prisons of Berlin, and Spandau, inserted in Nos. 97 and 98 of the *Freytmüthige*, May, 1805. Demangeon has given it in his *Physiologie Intellectuelle*, Paris, 1806.

“Dr. Gall having expressed a desire to inspect the prisons of Berlin, with the view of making himself acquainted with their arrangements and construction, as well as of observing the heads of the prisoners, it was proposed to him, that he should visit not only the prisons of that city, but the house of correction, and the fortress of Spandau.

“Accordingly, on the 17th of April, 1805, Dr. Gall began with those of Berlin, in presence of the directing commissaries, the superior officers of the establishment, the inquisitors of the criminal deputation, the counsellor Thürnagel, and Schmidt, the assessors Muhlberg, and Wunder, the superior counsellor of the medical inspection, Welper, Dr. Flemming, Professor Wilde-now, and several other gentlemen.

“As soon as Dr. Gall had satisfied himself in regard to the regulations and general management of the establishment, the party went to the criminal prisons, and to the *salles de travail*, where they found about 200 prisoners, whom Dr. Gall was allowed to examine, without a word being said to him, either of their crimes, or of their characters.

“It may here be remarked, that the great proportion of those detained in the criminal prisons, are robbers or thieves; and, therefore, it was to be expected, that if Dr. Gall's doctrine were true, the organ of Acquisitiveness should, as a general rule, be found to predominate in these individuals. This accordingly soon appeared to be the case. The heads of all the thieves resembled each other more or less in shape. All of them presented a width and prominence at that part of the temple, where the organ is situated, with a depression above the eyebrows, a retreating forehead, and the skull flattened towards the top. These peculiarities were perceptible at a single glance; but the

touch rendered still more striking, the difference between the form of the skulls of robbers, and that of the skulls of those, who were detained for other causes. The peculiar shape of the head, generally characteristic of thieves, astonished the party still more, when several prisoners were ranged in a line; but it was never so strikingly borne out and illustrated as when, at the request of Dr. Gall, all the youths from 12 to 15 years of age, who were confined for theft, were collected together; their heads presented so very nearly the same configuration, that they might easily have passed for the offspring of the same stock.

"It was with great ease, that Dr. Gall distinguished confirmed thieves, from those who were less dangerous; and, in every instance, his opinion was found to agree with the result of the legal interrogatories. The heads in which Acquisitiveness was most predominant, were that of Columbus, and, among the children, that of the little H., whom Gall recommended to keep in confinement for life, as utterly incorrigible. Judging from the judicial proceedings, both had manifested an extraordinary disposition for thieving.

"In entering one of the prisons, where all the women presented a predominance of the same organ, except one, (then busy at the same employment, and in precisely the same dress as the offenders,) Dr. Gall asked, as soon as he perceived her, why that person was there, seeing that her head presented no appearance indicative of any propensity to steal. He was then told, that she was not a criminal, but the inspectress of works. In the same way, he distinguished other individuals confined for different causes besides theft.

"Several opportunities of seeing Acquisitiveness, combined with other largely-developed organs, presented themselves. In one prisoner, it was joined with Benevolence, and the organ of Theosophy, the latter particularly large. This individual was put to the proof, and, in all his discourses, showed great

horror at robberies accompanied with violence, and manifested much respect for religion. He was asked, which he thought the worse action, to ruin a poor laborer by taking his all, or to steal from a church without harming any one? He replied, that it was too revolting to rob a church, and that he could never summon resolution enough to do it.

“Dr. Gall was requested to examine particularly the heads of the prisoners implicated in the murder of a Jewess, which had taken place the preceding year. In the principal murderer, Marcus Hirsch, he found a head, which, besides indicating very depraved dispositions, presented nothing remarkable, except a very great development of the organ of Perseverance. His accomplice, Jeanette Marcus, had an extremely vicious conformation of brain, the organ which leads to theft being greatly developed, as well as that of Destructiveness. He found in the female servants, Benkendorf and Babette, great want of circumspection; and, in the wife of Marcus Hirsch, a form of head altogether insignificant. All this was found to be in strict accordance with the respective characters of the prisoners, as ascertained by the legal proceedings.

“The prisoner Fritze, suspected of having killed his wife, and apparently guilty of that crime, although he still stoutly denied it, was next shown to Dr. Gall. The latter found the organs of Cunning, and Firmness, highly developed, — qualities, which his interrogator had found him manifest in the very highest degree.

“In the tailor Maschke, arrested for counterfeiting the legal coin, and whose genius for the mechanical arts was apparent in the execution of his crime, Gall found, without knowing for what he was confined, the organ of Constructiveness much developed, and a head so well organized, that he lamented several times the fate of that man. The truth is, that this Maschke was well known to possess great mechanical skill, and at the same time much kindness of heart.

“Scarcely had Dr. Gall advanced a few steps into



another prison, when he perceived the organ of Constructiveness equally developed in a man named Troppe, a shoemaker, who, without any teaching, applied himself to the making of watches, and other objects, by which he now lives. In examining him more nearly, Gall found also the organ of Imitation, generally remarkable in comedians, considerably developed;—a just observation, since the crime of Troppe was that of having extorted a considerable sum of money, under the feigned character of an officer of police. Gall observed to him, that he must assuredly have been fond of playing tricks in his youth, which he acknowledged. When Gall said to those about him, *‘If that man had fallen in the way of comedians, he would have become an actor,’* Troppe, astonished at the exactness and precision with which Gall unveiled his disposition, told them that he had in fact been some time (six months) a member of a strolling company,—a circumstance which had not till then been discovered.

“In the head of the unhappy Heisig, who, in a state of intoxication, had stabbed his friend, Gall found a generally good conformation, with the exception of a very deficient Cautiousness, or great rashness. He remarked in several other prisoners the organs of Language, Color, and Mathematics, in perfect accordance with the manifestations; some of the first spoke several languages; those with large Color were fond of showy clothes, flowers, paintings, &c.; and those with Mathematics large, calculated easily from memory.

On Saturday, 20th April, the party went to Spandau. Among those who accompanied Dr. Gall, were the privy counsellor Hufeland; the counsellor of the chamber of justice, Albrecht; the privy counsellor Kols; the professor Reich, Dr. Meyer, and some others. At the house of correction, observations were made upon 270 heads, and, at the fortress, upon 200. Most of them were thieves and robbers, who presented more or less exactly the same form of head,

of which the prisons of Berlin had exhibited a model. Including the whole, the prisons of Berlin and of Spandau, had thus subjected to the examination of Dr. Gall, a total of about five hundred thieves, most of them guilty of repeated offences; and in all, it was easy to verify the form of brain, indicated by Gall as denoting this unhappy tendency, and to obtain the conviction, from the discourse of most of them, that they felt no remorse for their crimes, but, on the contrary, spoke of them with a sort of internal satisfaction.

“The morning was spent in examining the house of correction, and its inmates; the most remarkable of whom were submitted, in the hall of conference, to the particular observation of Dr. Gall, sometimes one by one, and sometimes several at once. The combination of other organs, with that of Acquisitiveness, was also noticed.

“In Kunisch, an infamous thief and robber, who had established himself as a master-carpenter at Berlin, and who, in concert with several accomplices, had committed a great number of thefts with ‘*effraction*’ (burglary,) for which he had been shut up till he should be pardoned, Gall found, at the first glance, the organs of Mathematics, and of Constructiveness, with a good form of head in other respects, except that the organ of Acquisitiveness was exceedingly developed. Gall said on seeing him, ‘*Here is an artist, a mathematician, and a good head; it is a pity he should be here,*’—an observation remarkable for its accuracy, as Kunisch had shown so much talent for mechanics, that he was appointed inspector of the spinning machinery, the repairing of which was confided to him. Gall asked him if he knew arithmetic, to which he answered with a smile, ‘*How could I invent or construct a piece of work, without having previously calculated all the details?*’

“The head of an old woman, who was in prison for the second time for theft, presented a great develop-

ment of the organs of Acquisitiveness, Theosophy, and the Love of Offspring, especially the last. Upon being asked the cause of her detention, she answered, that she had stolen, but that she fell upon her knees every day, to thank her Creator for the favor she had received, in being brought to this house ; that she saw in this dispensation, one of the clearest proofs of the wonderful ways of Providence, for she had nothing so much at heart as her children, whom it was impossible for her to educate properly ; that since her imprisonment, they had been taken into the Orphan Hospital, where they were now receiving that education, which she had not had the means of giving them.

“Deficiency of Cautiousness was often joined to a great endowment of Acquisitiveness. This was particularly the case, in the woman Muller, whose head presented also a very remarkable development of the organ of ambition, (organ of Vanity,) which, according to Gall, degenerates into vanity in narrow-minded and ignorant persons. She was unwilling to acknowledge, that she was fond of dress, thinking that this was not in harmony with her present situation ; but her companions insisted, that she had much vanity, and was careful about nothing but her dress.

“In the prisoner Albert, the organ of Pride was joined with that of Acquisitiveness. *‘Is it not the case,’* said Gall to him, *‘that you were always desirous of being the first, and of distinguishing yourself, as you used to do, when still a little boy ? I am sure that, in all your sports, you then put yourself at the head.’* Albert confessed that it was so ; and it is true, that he still distinguishes himself by the command, which he assumes over the other prisoners, and by his insubordination, to the degree that, when a soldier, he could not be constrained but by the severest punishments ; and even now he generally escapes one punishment only to incur another.

“ Here, as at Berlin, Gall distinguished at a glance, such prisoners as were not thieves. Among others brought before him, was Régine Døring, an infanticide, imprisoned for life. This woman, different from the other infanticides, showed no repentance and no remorse for her crime, so that she entered the room with a tranquil and serene air. Gall immediately drew the attention of Dr. Spurzheim to this woman, by asking him, if she had not exactly the same form of head, and the same disposition to violence, as his gardener at Vienna, Mariandel, whose chief pleasure consisted in killing animals, and whose skull now serves at his lectures, as an example of the organ of Murder. This organ was found to be very largely developed in Régine Døring, and the posterior part of the head, in the situation of the organ of Love of Offspring, was absolutely flattened. This was in exact accordance with the character of the culprit, in so far as her examination bore upon it; for, not only has she had several children, of whom she has always secretly got rid, but she lately exposed and murdered one of them, already four years old, which would have led her to the scaffold, if the proofs had not been in some respects vague and incomplete, and her judges on that account had not preferred sentencing her to imprisonment for life.

“ One of the gentlemen present was a distinguished musician, upon whom Gall had incidentally pointed out one of the forms of development of the organ of Tune, which consists in a projection above the external angle of the eye. As soon as the prisoner, Kunow, appeared before him, ‘*Hold,*’ said Gall; ‘*here is the other form in which the organ of Music shows itself; it is here, as in the head of Mozart, of a pyramidal shape, pointed upwards.*’ Kunow immediately acknowledged, that he was passionately fond of music, that he had acquired it with facility; and the production of the jail register showed that he was as an amateur, that he had spent his fortune, and that latterly he



had had in view, to give lessons in music at Berlin. Gall asked what was his crime. It appeared, that he had spent his youth in debauchery, and had been condemned to imprisonment for an unnatural crime. Gall having examined his head, and found the organ of Propagation in enormous development, immediately exclaimed, '*C'est sa nuque qui l' a perdu ;*' — '*It is the nape of his neck, which has been his ruin.*' Then, carrying his hand upwards towards Cautiousness, which was exceedingly deficient, he added, '*Maudite légèreté*' — '*Unhappy instability.*'

"After dinner the party went to the fortress. Major de Beckendorf, the commandant, had the politeness to cause all the prisoners to be drawn up in line, to be presented to Dr. Gall. Here the organs of Cunning, and Acquisitiveness predominated, as in the other prisons. They were sometimes so strikingly apparent, that at a glance the thief might be distinguished from the other criminals. Raps, in whom the organ of Acquisitiveness was very conspicuous, attracted among others the notice of Gall, who discovered at the same time large organs of Murder and Benevolence. What makes the justness of these observations very remarkable is, that Raps strangled a woman whom he had robbed, and that on going away he untied the cord from compassion, and thus saved the poor woman's life after robbing her of her property. He then examined the young Brunnert, in whom he found the organs of Acquisitiveness, Locality, Constructiveness, and Pride, which were curiously verified in his history ; for Brunnert had committed several robberies ; had been confined in various prisons, from which he had escaped ; fixed himself nowhere ; deserted as a soldier ; underwent several castigations for insubordination ; and, having again rebelled against his superiors, was once more waiting his sentence. He was, besides, skilful in the mechanical arts, and showed some exquisitely finished works in pasteboard, which he had executed in a prison, a place very unfavorable to such talents.

"The organ of Mathematics was largely developed in some; and in each case, the power of calculation was found to correspond.

"Two peasants, father and son, mixed with the thieves, attracted notice from having quite different forms of head. Gall having examined them, found an enormous development of the organ of Pride, and said, '*These two have not wished to be ruled, but to rule themselves, and to withdraw from any thing like subordination.*' It was discovered, that the cause of their confinement was insolence to superiors.

"An old soldier, who was among the prisoners, had a very large organ of Acquisitiveness. It was, however, for insubordination, and not for theft, that he was confined in the fortress; but, on farther research, it appeared, that he had been punished several times in the regiment for having stolen."

These facts will not astonish the reader, who knows the means by which they were obtained.

Permit me to advert to a singular disposition manifested by many, Reil, for example, to attribute our discoveries to others. Spurzheim has, in several places, reclaimed our property, and I have done as much in respect to Sir E. Home, &c. The following passages, also quoted in Demangeon's work, will be serviceable to those, who have been unable to follow the chronological order of the successive discoveries in the structure of the brain.

"The worthy Reil" says Professor Bischoff, "who as a profound anatomist and judicious physiologist, has no need of my praise, rising above all narrow and selfish prejudices, has declared, 'that he has found more in Gall's dissections of the brain, than he could have believed it possible, for any one man to discover in his whole life.' Loder, who indisputably yields to no living anatomist, thus estimates the discoveries of Gall, in a friendly letter to my respectable friend, Professor Hufeland. 'Now that Gall has been at Halle, and I have had an opportunity, not only of

listening to his lectures, but also of dissecting with him, either alone or in the company of Reil and several others of my acquaintance, nine human brains and fourteen of brutes, I think I am both able and entitled to pronounce my opinion of his doctrines.

“‘I say then, that I agree with you in a great measure concerning organology, without, however, believing it to be at all contradictory to anatomy, being convinced that, in respect to its grounds and principles, it is true. There are still some particulars to be corrected, and the whole system is too much in its infancy to be explained as many take upon themselves to explain it. It is evident, notwithstanding, that very well marked faculties may be discovered by indications on the skull. The crania of Schinderhannes and six of his comrades, which Ackermann of Heidelberg lent me, presented a striking correspondence with the craniological indications of Gall. In the presence of S., with whom the little H., of Jena lived, who drowned herself in the Saale, after stealing several times, Gall gave such an exact description of the character of this girl, from an inspection of her skull (which I had secretly procured, and which no one knew I had), that S. was really amazed when I revealed the secret. There was no chance about this, and I may say the same of several other cases.

“‘The discoveries in the brain, made by Gall, are of the highest importance, and several of them are so obvious, that I cannot conceive, how, with good eyes, it is possible to overlook them. I speak particularly of the great ganglion of the brain (*corpora striata*), the passage of the pyramidal bodies into the crura of the brain and hemispheres, the bundles of the spinal marrow, the decussation of the fibres in the pyramidal and olivary bodies, the recurrent fibres of the cerebellum, the commissures of the nerves, the origin of the motor nerves of the eye, the trigemini, and the sixth pair. I pass over other things, which, though very reasonable, do not yet appear to be sufficiently proved

These discoveries alone, would be sufficient to render Gall's name immortal; they are the most important that have been made in anatomy, since that of the absorbent system. The unfolding the convolutions is a capital thing. What have we not a right to expect, from farther progress in a route thus opened! I am dissatisfied and ashamed of myself for having, like others, for thirty years, cut up some hundreds of brains, as we slice up cheese, and not perceived the forest by reason of the great number of trees. But what is the use of blushing and fretting? The best thing we can do is, to listen to the truth, and learn what we are ignorant of. I say, with Reil, that I have found more, than I deemed it possible for any one man to do in his whole life.

“‘I am unwilling as yet to publish any thing on the subject, because I am anxious to obtain the utmost weight of evidence, to indicate the steps that are proper to pursue, and perhaps even, add plates to illustrate the facts. With this object in view, I have already examined ten human brains, and shall examine as many more as I can get. I am desirous too of comparing the brains of wild and tame animals, and of birds and fishes; of injecting the minute vessels of the brain, preparing them with alcohol, acids, solution of corrosive sublimate, maceration, &c., and of committing my observations to writing. I hope soon therefore to publish such a work as you might expect of me.’ Thus thought and wrote the estimable Loder. Thus judged a man who, for nearly thirty years, had devoted himself to anatomy. His conduct proves, that true greatness consists in recognising the merit of others, and acknowledging one's own errors for the sake of truth.”

On page 143 of the same work, Hufeland, before commencing his criticisms, thus expresses himself. “It is with great pleasure, and much interest in the subject, that I have heard this estimable man (Gall) expound his new doctrine. I am fully convinced, that



it ought to be considered as one of the most remarkable phenomena of the eighteenth century, and one of the most important and boldest advances that have been made in the study of nature.

“One must see and hear, in order to learn that the man is entirely exempt from prejudice, charlatanism, deceit, and metaphysical reveries. Endowed with a rare spirit of observation, considerable penetration and powers of acute reasoning, identified, so to speak, with nature, and deriving confidence from his constant intercourse with her, he has collected a multitude of indications and phenomena, in organized beings, never before observed, or observed superficially. He has compared them ingeniously, found the relations that establish an analogy between them; has learned their signification, deduced consequences and established truths, so much the more precious for being invariably founded on experience, and flowing from nature herself. To this labor he is indebted for his views of the nature, relations and functions of the nervous system. He himself attributes his discoveries to the circumstance, that he has ingenuously and unreservedly yielded himself to nature, always following her through all her gradations, from the simplest to the most perfect results of her formative power. It is wrong therefore to give this doctrine, the name of a system, and judge it as such. True naturalists are not addicted to making systems. Their *coup d'œil* would not be so nice, if they started from a theoretical system, and facts would not always quadrate in so narrow a circle. Hence it is that Gall's doctrine neither is, nor can be, from the opinion he has expressed of it himself, any thing more than a collation of instructive natural phenomena, as yet partly consisting of fragments, the direct consequences of which he makes known.”

Such is the judgment which some most respectable men have passed on the anatomy and physiology of the brain, as I explained them directly after my depart-

ure from Vienna, in 1805. As they have since been improved and expounded in the six volumes of this work, it will be sufficient to give the reader a summary review of my labors.

---

### SUMMARY REVIEW.

In all my researches, my object has been to find out the laws of organization, and the functions of the nervous system in general, and of the brain in particular. The exposition of the nervous systems of the chest and abdomen, and of the spinal column, or of voluntary motion, has shown us the same laws, both as to their organization and purposes. The nervous fibres invariably originate from the gray substance, as their matrix, and finally expand on the surface. Whenever an essentially different function appears, there is invariably a particular nervous organization, or system, independent of the rest. I have demonstrated the same laws of organization in the brain. The cerebral nervous fibres all originate in the gray substance, and are successively reinforced by new masses of the gray substance. Many bundles of nervous fibres exist independently of one another, and all finally expand in a nervous membrane, either spread out, or rolled up in the form of convolutions. This uniformity of the laws of organization of all the nervous systems, leaves no doubt as to the correctness of the anatomical discoveries of the nervous systems in general, and of the brain in particular.

Having determined the functions of the nervous systems of the chest, abdomen, vertebral column, and the five senses, there still remains the great difficulty of determining the functions of the brain and its different parts. Before entering upon this essential part of my system, it was indisdispensably necessary to correct the common notions respecting the origin of the in-

instincts, industrious habits, propensities, and faculties. Hence, an entire section is devoted to prove, that all our moral and intellectual dispositions are innate, and that every manifestation of a moral quality or intellectual faculty, depends on organization. Now I would ask, what is this organization, this instrument of all the moral and intellectual functions? Is it the entire body? Is it temperament? Is it a single part of the body, and what part is it? I have established the fact by a great many proofs, negative and positive, and by refuting the most important objections, that the brain alone has the great prerogative of being the organ of the mind. From farther researches, on the degree of intelligence possessed by both man and brutes, we draw the conclusion, that the complexity of the brain of brutes is in proportion to that of their propensities and faculties; that the different regions of the brain are devoted to different classes of functions; and that finally, the brain of each species of animals, man included, is formed by the union of as many particular organs, as there are essentially distinct moral qualities and intellectual faculties.

The moral and intellectual dispositions are innate; their manifestation depends on organization; the brain is exclusively the organ of the mind; the brain is composed of as many particular and independent organs, as there are fundamental powers of the mind;—these four incontestable principles form the basis of the whole physiology of the brain.

These principles having been thoroughly established, it was necessary to inquire, how far the inspection of the form of the head, or cranium, presents a means of ascertaining the existence or absence, and the degree of development, of certain cerebral parts; and consequently the presence or absence, the weakness or energy of certain functions. It was necessary to indicate the means for ascertaining the functions of particular cerebral parts, or the seat of the organs, and finally, it was indispensable, to distinguish the primi-

tive fundamental qualities and faculties, from their general attributes.

After that I was enabled to introduce my readers into the sanctuary of the soul and the brain, and give the history of the discovery of each primitive moral and intellectual power, its natural history in a state of health and of disease, and numerous observations in support of the seat of its organ.

An examination of the forms of heads of different nations, a demonstration of the futility of physiognomy, a theory of natural language, or pathognomy, added new weight to preceeding truths.

The thorough development of the physiology of the brain, has unveiled the defects of the theories of philosophers, on the moral and intellectual powers of man, and has given rise to a philosophy of man founded on his organization, and consequently, the only one in harmony with nature.

Finally, I have discussed four propositions equally interesting to history and philosophy, concerning the motives of our actions, the origin of the arts and sciences, the perfectibility of the human species, and the capacity of the world of each living being, and I have shown, that the solution of all these questions, hitherto problematical, springs directly from the physiology of the brain.

Many, and even well educated people, but knowing nothing of organology, except from common report, have asked me, with the most astonishing naïveté, if I really believe my own notions. It seems as if they supposed that I would be the first to be convinced of their error, but that I was desirous, either of enjoying the reputation of being the founder of an ingenious system, or of maintaining, from pride, opinions that had been hastily published.

If I were a man to be gratified with a little temporary eclat, I should have yielded, more than twenty years ago, to the desire of publishing the first views of a physiology of the brain, but I am prouder of the



discovery of the slightest truth, than the invention of the most brilliant system.

The physiology of the brain is entirely founded on observations, experiments, and researches for the thousandth time repeated, on man and brute animals. Here, reasoning has had nothing more to do with it, than to seize the results, and deduce the principles that flow from the facts; and therefore it is, that the numerous propositions, though often subversive of commonly received notions, are never opposed to or inconsistent with one another. All is connected and harmonious; every thing is mutually illustrated and confirmed. The explanation of the most abstruse phenomena of the moral and intellectual life of man and brutes, is no longer the sport of baseless theories; the most secret causes of the difference in the character of species, nations, sexes, and ages, from birth to decrepitude, are unfolded; mental derangement is no longer connected with a spiritualism that nothing can reach; man, finally, that inextricable being, is made known; organology composes and decomposes, piece by piece, his propensities and talents; it has fixed our ideas of his destiny, and the sphere of his activity; and it has become a fruitful source of the most important applications to medicine, philosophy, jurisprudence, education, history, &c. Surely, these are so many guarantees of the truth of the physiology of the brain — so many titles of gratitude to HIM, who has made them known to me!



